NATIONAL OCEANOGRAPHIC DATA CENTER

MANUAL SERIES

PROCESSING PHYSICAL AND CHEMICAL DATA FROM OCEANOGRAPHIC STATIONS

PUBLICATION M-2

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government agencies having an interest in the marine environ-
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FOREWORD

This publication describes the methods used at the National Oceanographic Data Center (NODC) for reducing processed physical and chemical oceanographic station data to a standard format. It is intended also for use by other agencies or contributors interested in furnishing oceanographic data to NODC or making their data systems compatible with those of NODC. An outline of the format of the Computed Card is included in order to acquaint the users of the NODC oceanographic station data holdings with the end product of the routinely performed computations.

W. C. JACOBS
Director
National Oceanographic Data Center

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INTRODUCTION

This manual is intended to provide the necessary instructions
and conversion tables for reducing processed marine physical and
chemical environmental data collected at oceanographic stations to
a standard format. Instructions for punching the National Oceano-
graphic Data Center (NODC) Physical and Chemical Oceanographic Station
Data Punch Card also are contained in this manual. This is the stand-
ard format used at the NODC; it is intended also for use by other
agencies or contributors interested in furnishing oceanographic data
to the Data Center or making their data systems compatible with those
of NODC. The card format and codes described in this manual have
resulted from comments and suggestions by the oceanographic community.
Its main features are based on the report of the Eastern Pacific Oceanic
Conference (EPOC) Committee on Machine Processing for Oceanographic Data,
the International Council for the Exploration of the Sea (ICES) oceano-
graphic station card format, the Canadian Oceanographic Data Center (CODC),
and the card format formerly used at the U. S. Navy Hydrographic Office.

The card used by NODC is the 80-column Hollerith punch card. Each
column contains ten numbers (0-9) and two additional places above the
0, designated as the X and Y overpunches. Only one number is used in
each column; X and Y are used in combination with numbers to produce
alphabetic codes or to denote various special numeric indicators.

Three basic oceanographic station data cards are in use currently at NODC. These are the Master Card, the Observed Detail Card, and the Standard Detail Card. Actually, a single, multi-purpose card is used on which the three headings are printed; the identification of the card and the headings to be used are indicated by a control punch in Column 80. The function of each card is as follows: (1) a single Master Card is used to identify each oceanographic station and to record general surface environmental and meteorological information at the station; (2) a separate Observed Detail Card is punched for each depth at which chemical and physical data were taken; and (3) a Standard Detail Card may be punched for standard depths with interpolated physical and chemical data; usually this card is produced automatically by the IBM 7070/1401 Computer System for all standard depths.

The standard multi-purpose card also is used to record the results of the various computations programmed by NODC on the IBM 7070; when cards bear computed values they are referred to as Computed Cards; before computation they are called Data Cards. Additional types of cards are currently under development for recording biological, geological, and additional chemical information observed at the station.

Each oceanographic cruise or source of oceanographic station data processed by NODC is assigned a "reference identity number." NODC Publication C-1, "Reference Sources for Oceanographic Station Data," gives the bibliographic and other pertinent information for each cruise

by reference identity number. A cruise master card bearing information common to the cruise as a whole, as well as codes indicating observational techniques and accuracy, eventually will be provided for each cruise. The format of this card is now being developed by NODC on the basis of comments and suggestions received from the oceanographic community.

To facilitate card punching, all data are coded or transcribed onto the NODC "Physical and Chemical Data Form for Oceanographic Stations," NODC form NHO-NODC-3167/1 (9-61), which contains space for coding the station Master Card information and for coding physical and chemical information at 25 observed depths. The entries on this form are arranged in the same order as they appear on the punch card (decimal places are marked by dots). The shaded portion of the form is for information to be filled in by NODC only. Some columns are left out on the portion of the form which corresponds to the detail card; these data are always machine reproduced or computed and do not need to be filled in by the observer or coder.

CODING THE MASTER CARD INFORMATION

General instructions for entries on the data form:

1. Use standard rounding procedures whenever rounding is necessary.

    Example: > 5 add one (1) to preceding column
              < 5 drop
              5 round to nearest even number

2. When necessary, 0's are prefixed to fill a field but do not need
to be suffixed.

> Example: A temperature of 6.3°C. should be
> recorded and punched in Columns 33-37
> as 06.3 with Columns 36 and 37 left
> blank and unpunched.

ENTRIES FOR SURFACE ENVIRONMENTAL INFORMATION (MASTER CARD)

(See Appendix I, page 105, for sample Physical and Chemical Data Form.)

COLUMNS 1 and 2   COUNTRY CODE

Enter the IGY country code shown in Table 1. Regardless of the ship's
registry, country code should reflect the nationality of the agency
sponsoring or operating the vessel for the particular cruise being
coded.

COLUMNS 3 and 4   SHIP CODE

Enter the first two letters of the ship's name (eg. AL = ALBATROSS,
DI = DISCOVERY, HS = HUGH M. SMITH). Duplication of ship letters within
any one country code must be avoided (e.g. U. S. ALBATROSS = AL,
U. S. ALBACORA = AB). If ship is unknown, leave Columns 3 and 4 blank.

COLUMNS 5 - 9   LATITUDE

Enter latitude in degrees and minutes. Enter tenths of minute, when
available, in Column 9. Table 2 converts seconds to tenths of a minute.
Enter N or S in the space provided on the data form.

COLUMNS 10 - 15   LONGITUDE

Enter longitude in degrees and minutes. Enter tenths of minute, when
available, in Column 15. Table 2 converts seconds to tenths of a minute.
Enter E or W in the space provided on the data form.

COLUMNS 16 - 18   MARSDEN SQUARE

This number will be machine computed if not given. A Marsden Square

Chart is provided as Table 3 for convenience in locating the station

positions according to the Marsden Square system.

Note on Columns 5—18: For station position use location as determined on arrival at oceanographic station whenever possible. Indicate appreciable drift during the time station was occupied by an entry in the Remarks space and a red dash in Column 16.

COLUMNS 19 - 20   YEAR

Enter last two digits of year as determined by Greenwich Mean Time (GMT).

COLUMNS 21 - 22   MONTH

Enter month as determined by GMT, using Arabic numerals 01 through 12.

COLUMNS 23 - 24   DAY

Enter day of month as determined by GMT. Prefix 0 if less than 10.

COLUMNS 25 - 27   TIME

Enter hour and tenths of hour of time of station in GMT. Use either

time of first cast or time at which applicable surface environmental

data were obtained. Table 4 converts local time to GMT and Table 2

converts minutes to tenths of an hour.

COLUMNS 28 - 30   SHIP'S CRUISE NUMBER

Enter the number, alphabetic or alpha-numeric designator or its closest

equivalent, assigned to the cruise by the originator. Leave blank if

none.   Example: MRL 60 = 060

COLUMNS 31 - 33   SHIP'S STATION NUMBER

Enter ship's station number as assigned by the originator. When complex

station numbering systems are employed (such as station numbers containing

positional codes) which require more than 3 columns to record, use the additional columns in the Special Observations field, Columns 68-72. In this case, put a red dash in Column 68.

COLUMNS 34 - 37   DEPTH TO BOTTOM

Enter corrected or uncorrected soundings (as determined at the location given in Columns 5-15) in meters. For corrected soundings, put a red dash in Column 37. Table 5 converts fathoms to meters; Table 6 converts feet to meters. Although Table 6 is given to tenths of a meter for added accuracy in recording observed depths in the detail card, depth to bottom, Columns 34-37, is rounded to the nearest whole meter.

COLUMNS 38 - 39   MAXIMUM SAMPLE DEPTH

Enter the depth of the deepest sample (temperature or salinity or both) to the nearest hundred-meter interval. Round as follows: 0-50 = 00, 51-150 = 01, 151-250 = 02, etc.

COLUMNS 40 - 41   ADDITIONAL OBSERVATIONS CODE

A two digit code to indicate various kinds of additional data collected at the station but not recorded on the Master or Detail Card is to be entered in this space. The code currently is under development; when completed it will be issued as Table 7.

COLUMNS 42 - 45   WATER COLOR AND TRANSPARENCY

Enter water color in Columns 42 and 43 according to the Forel-Ule scale. Table 8 shows the Forel-Ule scale and conversions from other color scales. Enter transparency values in whole meters in Columns 44 and 45 obtained by using a white, 30 cm. Secchi disc.

COLUMNS 46 - 49   WAVE DIRECTION, HEIGHT AND PERIOD
                                              (OR SEA STATE)

Enter the direction from which the dominant waves come in Columns 46 and

47 according to WMO Code 0885 (23B)* as shown in Table 9. (If wave height

is 16 feet or greater, 50 must be added to code value of direction.)

Enter the height of the dominant waves in Column 48 according to WMO

Code 1555 (42)* shown in Table 11. (If Sea State is given, see note below.)

Enter the period of the dominant waves in Column 49 according to WMO Code

3155 (69)* as shown in Table 12.

*To record Sea State instead of wave height and period, enter the state of sea (or amount) in Column 48
according to WMO Code 3700 (75)* as shown in Table 13 and cross out H in Column 48; leave Column 49
blank.*

COLUMNS 50 - 53   WIND DIRECTION AND SPEED (OR FORCE)

Enter direction from which the wind blows in Columns 50 and 51 according

to WMO Code 0877 (23)* as shown in Table 9. Table 10 is for conversion

from points, quarter points, or a scale of 32.   There is a choice of

either wind speed or force in this field:

     1. Wind speed in knots. Conversions are given in:

          Table 14 (meters/second to knots)

          Table 15 (miles/hour to knots)

          Table 16 (kilometers/hour to knots)

          Table 17 (feet/second to knots)

     2. Wind force according to the Beaufort scale as

defined by Table 18. (Do not use WMO Code 1144 (30)*.)

Important: the unit not used, i.e. speed or force,

should be crossed off the data form.

*Number in parentheses represents old WMO Code number.

COLUMNS 54 - 56 BAROMETER

Enter barometric pressure in millibars. Enter tens, units, and tenths only. (Example: 1012.62 = 12.6.) The recordable range is 945.0 to 1044.9 mbs. Enter pressure falling outside this range in the Remarks space of the data form. Table 19 converts inches to millibars. Table 20 converts millimeters to millibars.

COLUMNS 57 - 62 AIR TEMPERATURE, DRY BULB AND WET BULB TEMPERATURES

Enter dry bulb temperature in Columns 57-59 and wet bulb temperature in Columns 60-62 in °C to tenths. Indicate negative temperature by a prominent red dash over the numeral(s) in Column(s) 57 and/or 60. Table 21 converts °F to °C.

COLUMNS 63 - 64 WEATHER

There is a choice of two types of entries for weather:

1. Enter an X in Column 63 and enter the weather in Column 64 according to the single digit WMO Code 4501 (90A)* as shown in Table 22. This is the preferred weather code.

2. Enter present weather in Columns 63 and 64 according to the two digit WMO Code 4677 (92)* as shown in Table 25. Because code figures 00 through 03 are not descriptive of present weather, Code 4501 is preferred instead of these code figures. Conversions from other weather codes are given in Tables 23 and 24.

*Number in parentheses represents old WMO Code number.

COLUMN 65   CLOUD TYPE

Enter type (genus) of cloud according to WMO Code 0500 (10)* as shown
in Table 26.

COLUMN 66   CLOUD AMOUNT

Enter cloud amount (fraction of the sky covered by clouds) in eighths
according to WMO Code 2700 (60)* as shown in Table 27.

COLUMN 67   VISIBILITY

Enter visibility according to WMO Code 4300 (85A)* as shown in Table 28.

COLUMNS 68 - 72   SPECIAL OBSERVATIONS

Enter special observations in this space. Specify nature of special
observations, units, codes, and columns used in the Remarks space of
the data form. As mentioned previously, these columns also may be
used for ship's station numbers that exceed 3 digits (see page 5,
Columns 31-33, SHIP'S STATION NUMBER). However, when used for this
purpose, no other information may be placed in this field.

COLUMNS 73 - 80   PROCESSING NUMBERS
                                (TO BE COMPLETED BY NODC)

The reference identity number assigned by NODC is entered in Columns
73-75.

NODC assigns numbers to each station consecutively in the order in which
they appear in the source. These "consec numbers" are entered in Columns
76-79. NODC enters one (1) in Column 80 to identify the station Master
Card.

*Number in parentheses represents old WMO Code number.

CODING THE DETAIL CARD INFORMATION

General instructions for entries on the data form:

1. Columns 32, 37, and 42, marked i, may be used for the following purposes:

    a) For insertion of an additional decimal place, if needed, or

    b) For insertion of a "precision of measurement" indicator. An alphabetic code, applicable to depth, temperature, and salinity, will indicate the estimated limits of accuracy determined by the observer. This code, presently under development, will be distributed as Table 29. (Columns 32, 37, and 42 cannot be used simultaneously for any one cruise or station for both additional decimal places and precision of measurement indicator.)

2. To indicate doubtful depth, temperature, and salinity place a question mark (?) in the indicator columns (i.e., Columns 32, 37, and 42) or in the case of oxygen and optional chemistry after the last numeral of the value in the last column of the field. The last column of each field has been widened on the data form to allow for the possible entry of both a numeral and a question mark.

ENTRIES FOR SUBSURFACE OBSERVATIONS (DETAIL CARD)

(See Appendix I, page 105, for sample Physical and Chemical Data Form.)

COLUMNS 1 - 24   IDENTIFICATION ENTRIES

These columns are identical to the Master Card and need not be filled in.
The information is automatically reproduced in the Observed Detail Card
from the Master Card.

COLUMNS 25 - 27   MESSENGER TIME

Enter hour and tenths of hour in GMT at time of release of messenger
applicable to the observational level. Table 2 converts minutes to
tenths of an hour. The time entry also serves to distinguish multiple
casts at one station. If a single cast constitutes the station, the
messenger time need be entered only at the shallowest (0-meter) level.

COLUMNS 28 - 32   DEPTH OF SAMPLE

Enter depth of a sample in meters in Columns 28 - 31. Column 32 may be
used to enter tenths of a meter, if desired, or the alphabetic precision
indicator (see general instructions). To indicate thermometrically
determined depths place a cross (†) in Column 32. The entries in the
depth field should be corrected depths only. Standard depths are
normally interpolated by the computer and need not be entered on the
data form.

If interpolated standard depths are entered, leave messenger time blank and insert a 7 in Column 80.

COLUMNS 33 - 37   TEMPERATURE

Enter temperature in °C to hundredths in Columns 33-36; Column 37 is
for an additional decimal or precision indicator coded according to
Table 29. To indicate a negative temperature, place a prominent minus
sign in red before the numeral entry in Column 33. (Column 33 has
extra width for this purpose.)

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COLUMNS 38 - 42   SALINITY

Enter salinity in parts per thousand to hundredths in Columns 38-41;
Column 42 is for an additional (thousandths) decimal. Table 30 converts
chlorinity to salinity.

Columns 43—50 do not appear on the data form. On the punch card these columns are reserved for com-
puted sigma-t and sound velocity. Sound velocities measured by a velocimeter (or temperatures or salinities
based on these measurements) should be forwarded or coded separately.

COLUMNS 51 - 53   OXYGEN

Enter oxygen in milliliters per liter (ml/l) to hundredths in Columns
51-53. (If determined to tenths only leave Column 53 blank.) Table 31
converts milligrams per liter (mg/l) and Table 32 converts milligram-
atoms per liter (mg-at/l) to ml/l.

To record oxygen values greater than 9.99 ml/l enter two numerals (tens and units) in Column 51.

COLUMNS 54 - 71   OPTIONAL CHEMISTRY

Columns 54-71 are intended for entry of the additional chemistry described
below; this is the only chemistry that will be punched routinely. A
special punch card to record chemistry other than that shown below is
being developed at NODC. However, any chemistry may be substituted in
these columns by special request provided that:

> 1. It can be reported in a 3 digit field.
>
> 2. The nature and units of the substituted
>   chemistry and the columns used are fully
>   described in the Remarks space of the data
>   form.

COLUMNS 54 - 56   PHOSPHATE

Enter inorganic phosphate in microgram-atoms per liter (μg-at/l) to hundredths. Conversions from other units are shown in Tables 33-35.

COLUMNS 57 - 59   TOTAL PHOSPHORUS

Enter total **P** in microgram-atoms per liter (μg-at/l) to hundredths.

COLUMNS 60 - 62   NITRITE-NITROGEN

Enter nitrite-nitrogen (NO_2-N) in microgram-atoms per liter (μg-at/l) to hundredths. Conversions from micrograms per liter of NO_2 to microgram-atoms per liter of NO_2-N are shown in Table 36.

COLUMNS 63 - 65   NITRATE-NITROGEN

Enter nitrate-nitrogen (NO_3-N) in microgram-atoms per liter (μg-at/l) to tenths. Conversions from micrograms per liter of NO_3 to micrograms-atoms per liter of NO_3-N are shown in Table 37.

COLUMNS 66 - 68   SILICATE-SILICON

Enter silicate-silicon in microgram-atoms per liter (μg-at/l). Conversions from other units are shown in Tables 38-40.

COLUMNS 69 - 71 $_pH$

Enter $_pH$ in Columns 69-71.

COLUMN 72

This column (reserved for NODC) is to be left blank.

Columns 73-79 are omitted from the data form; on the punch card these will be reproduced automatically from the Master Card to provide each Detail Card with reference identity and consecutive numbers.

For observed sample depths enter 3 in Column 80 to indicate an Observed

Detail Card. If interpolations are made by non-machine methods for

standard depths enter a 7 in Column 80. (Computed elements such as

sigma-t, sound velocity, dynamic depth anomaly, etc. will be computed

for this type of card, but computations will be based on the temperature

and salinity as interpolated by the originator.)

In a few instances only interpolated data may be available for certain stations. In that case the numeral 4 is entered in Column 80. Such a card will be treated by the computer as though it were an observed level. Stations based on such interpolated data will be appropriately marked "LIT" on listings.

INSTRUCTIONS FOR PUNCHING NODC OCEANOGRAPHIC STATION CARDS
FROM THE PHYSICAL AND CHEMICAL DATA CODING FORM

(See Appendix I, page 105, for sample Oceanographic Station Card.)

In general the physical and chemical data form for oceanographic
station data is arranged in such a manner that most of the numeric and
alphabetic entries can be punched directly into the corresponding
columns of the punch card. The alphabetic punch code used at NODC is
the standard IBM code. The correct entry columns for certain over-
punches, however, cannot readily be determined from the data form.
The correct entry for these overpunches is given in the punching
instructions below.

MASTER CARD

ENTRY ON DATA FORM	ENTRY IN PUNCH CARD (OVERPUNCHES UNLESS STATED OTHERWISE)
Entry S between Columns 9 and 10.	x in Column 8
Entry E between Columns 15 and 16.	x in Column 14
Red dash in Column 16	x in Column 15
Red dash in Column 37	x in Column 37
Letter H crossed out in Column 48 (A not crossed out) and no entry in Column 49	x in Column 47
Entry X in Column 48	Punch alphabetic X in Column 48
Entry X in Column 49	Punch alphabetic X in Column 49
Word SPEED crossed out over Columns 52 and 53 (word FORCE not crossed out)	x in Column 52

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Red dash in Column 57	x in Column 59
Red dash in Column 60	x in Column 62
Letter in Column 63	Punch alphabetic X in Column 63
Entry X in Column 65	Punch alphabetic X in Column 65
Red dash in Column 68	x in Column 68
Card Type	Enter 1 in Column 80

DETAIL CARD

CODING FORM	PUNCH CARD
Columns 1 - 24	Reproduced from Master Card
Question mark (?) in Column 32	Q in Column 32
Cross (†) in Column 32	x in Column 28
Red dash in Column 33	x in Column 36
Question mark (?) in Column 37	Q in Column 37
Question mark (?) in Column 42	Q in Column 42
Two (2) numerals in Column 51	x in Column 51
Question mark (?) in Column 53	x in Column 53
Columns 73 - 79	Reproduced from Master Card

An outline of the format of the Computed Card is included in this manual in order to acquaint the users of the NODC oceanographic station data holdings with the end product of the routinely performed computations. (A detailed description of formulas and techniques used for interpolations and computation of various parameters will be described in a future NODC publication in the General Series.)

The manually punched cards described in the previous section are used as data cards for the NODC computer. The end product of the computation process is a new set of cards referred to as the Computed Cards. There are two types of Computed Cards. One type contains computed parameters as well as the original observed information. The other type contains computed values only and is generated for all standard depths; this card carries the interpolated values of temperature, salinity, and oxygen as well as certain additional parameters which are computed for standard depths only.

The routinely computed parameters which appear on each type of Computed Card are as follows:

NAME OF CARD TYPE	COMPUTED PARAMETER
Computed Master Card*	Marsden square number
Computed Observed Card*	1. Sigma-t (σ_t)
	2. Sound velocity (ft./sec.)

*Code indicators for each card type are given in table on Page 21.

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Computed Standard Depth Card*

1. Interpolated values of temperature, salinity, and oxygen

2. Sigma-t (σ_t)

3. Sound velocity (as above)

4. Specific volume anomaly

5. Dynamic depth anomaly

Additionally, a number of overpunches are included in these cards, some of which are generated during the computation process. A complete list of overpunches which may be used in the basic NODC physical and chemical oceanographic station data Computed Card follows.

*Code indicators for each card type are given in table on Page 21.

COMPUTED MASTER CARD (CODE 1 IN COLUMN 80)

Columns 1 - 4	Alphabetic code (possible)
Column 8	x = South (no x = North)
Column 14	x = East (no x = West)
Column 15	x = "extensive" drift while on station
Columns 28 - 33	Alphabetic code (possible)
Column 37	Corrected sounding
Columns 40 - 41	Reserve x and y code overpunch for Additional Observations Code
Column 47	x = State of the sea (or sea amount) given rather than wave height and period
Column 48	Alphabetic code (X) to indicate height of waves not determined
Column 49	Alphabetic code (X) to indicate calm, or period not determined
Column 52	x = Wind force given rather than speed
Column 59	x = Negative air temperature (DRY)
Column 62	x = Negative air temperature (WET)
Column 63	Alphabetic code (X) to indicate use of WMO 4501 (90A)*
Column 65	Alphabetic code (X) to indicate clouds not visible owing to darkness, fog, etc.

*Number in parentheses represents old WMO Code number.

Column 68	x = Entry in Columns 68-72 is continuation of Ship's Station Number field.
Column 78*	x = Geographical sorted deck indicator
Column 79*	x = Computed deck indicator

COMPUTED OBSERVED CARD (CODE 3 OR 4 IN COLUMN 80)

Columns 1 - 24	Reproduced from Master Card
Column 28	x = Thermometric depth
Column 32	Alphabetic code for precision indicator. Q indicates doubtful depth.
Column 36	x = Negative temperatures
Column 37	Alphabetic code for precision indicator. Q indicates doubtful temperature.
Column 42	Alphabetic code for precision indicator. Q indicates doubtful salinity.
Column 46*	x = Negative sigma-t (σ_t)
Column 47*	x = Add 5000 to value in Columns 47-50
	No x = Add 4000 to value in Columns 47-50
Column 51	x = Add 10 to O_2 value
Column 53	x = Doubtful

*Overpunch generated during the computation process.

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COMPUTED STANDARD DEPTH CARD (CODE 6 OR 7 IN COLUMN 80)

Columns 1 - 53   Same as Observed Detail Card

Column 59*   x = Negative specific volume
                                            anomaly

Column 63*   x = Negative dynamic depth
                                            anomaly

CARD TYPE IDENTIFICATION CODE

CARD TYPE	CODE IN COLUMN 80
Master	1
Observed	3 or 4**
NODC Computed Standard	6
Originator's Computed Standard	7

*Overpunch generated during the computation process

**When only originator's computed standard values are available,
a 4 is placed in Column 80. This card will act as an Observed
Card in the NODC computer; i.e., it may carry optional chemistry.
In addition, NODC Computed Standard Cards (type 6) will be
computed.

TABLE 1

Country Code

International Geophysical Year (IGY) Code

CODE   NAME

01   Afghanistan
08   Argentina
09   Australia
10   Austria

11   Belgium
23   Belgian Congo
13   Bolivia
14   Brazil
84   British Caribbean Territories
83   British East African Territories and
                 Indian Ocean Islands
85   British Malaya/Borneo Territories
82   British West African Territories
15   Bulgaria
12   Burma

16   Cambodia
18   Canada
19   Ceylon
20   Chile
21   China
22   Columbia
81   Czechoslovakia

26   Denmark
70   Dominican Republic

28   Ecuador
27   Egypt
75   El Salvador
32   Ethiopia

33   Federation of Rhodesia and Nyasaland
34   Finland
35   France
17   French Cameroons
02   French Equatorial Africa
30   French Oceania
25   French Somaliland
87   French Togoland
03   French West Africa

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TABLE 1 (Cont'd)

CODE	NAME
06	Germany
36	Greece
37	Guatemala
38	Haiti
39	Hong Kong
40	Hungary
46	Iceland
41	India
42	Indonesia
44	Iran
43	Iraq
45	Ireland
47	Israel
48	Italy
49	Japan
50	Jordan
24	Korea
51	Laos
52	Lebanon
53	Libya
54	Luxembourg
55	Madagascar
56	Morocco
57	Mexico
64	Netherlands
07	Netherlands Antilles
60	Netherlands New Guinea
59	New Caledonia
61	New Zealand
58	Norway
62	Pakistan
63	Paraguay
72	People's Republic of Albania
65	Peru
66	Philippines
67	Poland
68	Portugal
05	Portuguese East Africa
04	Portuguese West Africa

TABLE 1 (Cont'd)

CODE	NAME
73	Romania
29	Spain
76	Sudan
79	Surinam
77	Sweden
78	Switzerland
80	Syria
86	Thailand
88	Tunisia
89	Turkey
91	Union of South Africa
90	Union of Soviet Socialist Republics
74	United Kingdom of Great Britain and Northern Ireland
31	United States of America
92	Uruguay
93	Venesuela
94	Viet-Nam
95	Yugoslavia

NOTE: 69 and 71 have not been assigned.

TABLE 2

Tenths Conversion

Conversion from seconds (of position) or minutes (of time) to tenths of minutes or hours

Range of Secs. or Mins.	Tenths of Mins. or Hrs.
00 - 05	0
06 - 11	1
12 - 17	2
18 - 23	3
24 - 29	4
30 - 35	5
36 - 41	6
42 - 47	7
48 - 53	8
54 - 59	9

TABLE 3

MARSDEN SQUARE CHART

H.O. 17041
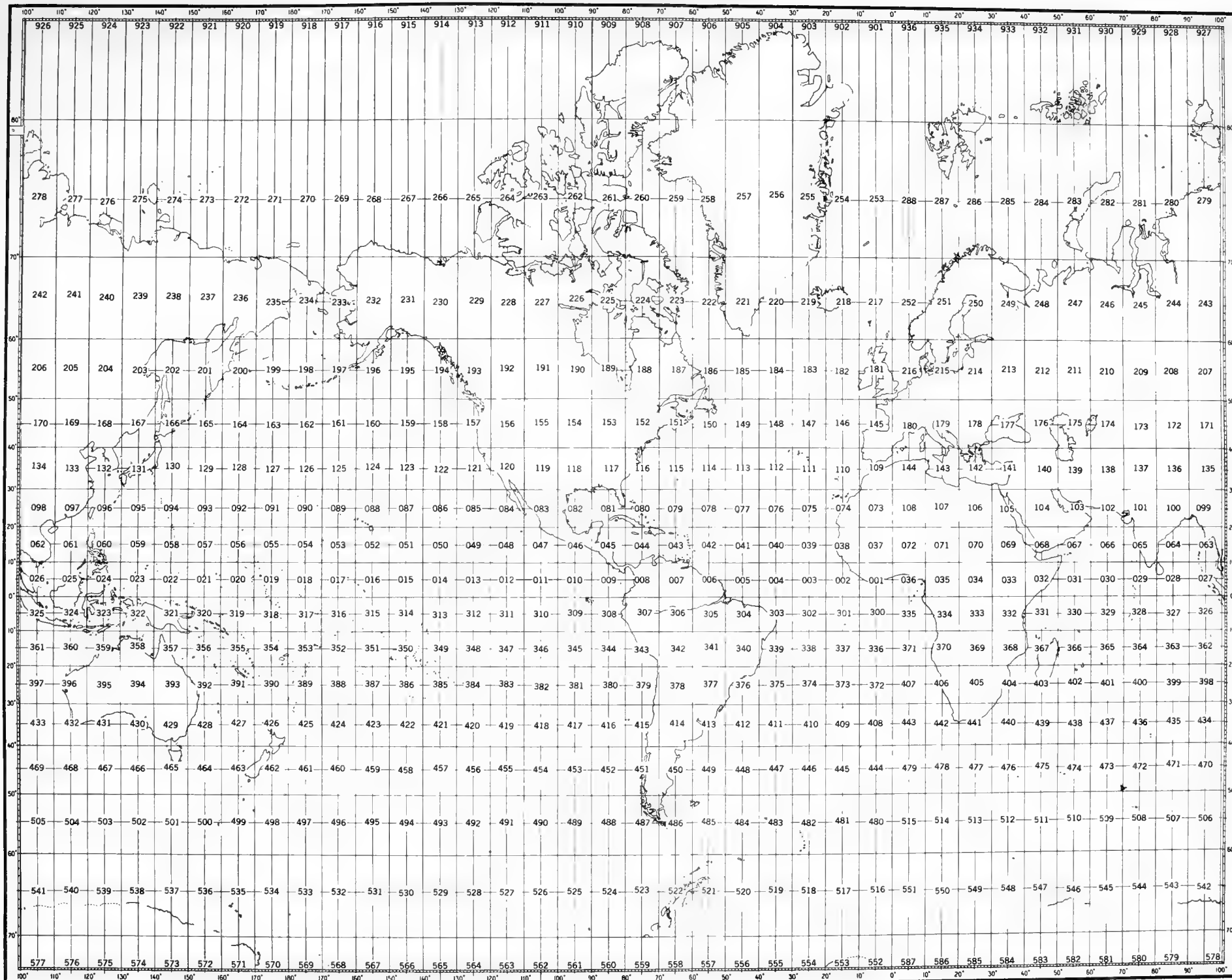
Time

Conversion from local time to Greenwich mean time (GMT)

TABLE 4

FOLLOWING DAY

TIME-ZONE CONVERSION TABLE

WEST LONGITUDE | EAST LONGITUDE

Time Zone	+12	+11	+10	+9	+8	+7	+6	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12
Zone	Y	X	W	V	U	T	S	R	Q	P	O	N	Z (GMT)	A	B	C	D	E	F	G	H	I	K	L	M
Longitude	172°30'	157°30'	142°30'	127°30'	112°30'	97°30'	82°30'	67°30'	52°30'	37°30'	22°30'	07°30'	07°30'	07°30'	22°30'	37°30'	52°30'	67°30'	82°30'	97°30'	112°30'	127°30'	142°30'	157°30'	172°30'
	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01
	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02
	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03
	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04
	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05
	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06
	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07
	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08
	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10
	11	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11
	12	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12
	13	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13
	14	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
	15	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	16	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
	17	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
	18	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
	19	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	20	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
	21	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
	22	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
	23	24/00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23

PRECEDING DAY

EXPLANATION:

If day change (diagonal) line is crossed from right to left, subtract one day; from left to right, add one day.

To convert from local time to any other time, locate local time in zone column and proceed horizontally to zone wanted. Example 05 in L (-11) time is 18 GMT of preceding day.

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TABLE 5

Depth

Conversion from fathoms to meters
(1 fathom = 1.8288 meters)

Fathoms	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Meters	0	0	0	1	1	1	1	1	1	2
Fathoms	0	1	2	3	4	5	6	7	8	9
00	0000	0002	0004	0005	0007	0009	0011	0013	0015	0016
10	0018	0020	0022	0024	0026	0027	0029	0031	0033	0035
20	0037	0038	0040	0042	0044	0046	0048	0049	0051	0053
30	0055	0057	0059	0060	0062	0064	0066	0068	0069	0071
40	0073	0075	0077	0079	0080	0082	0084	0086	0088	0090
50	0091	0093	0095	0097	0099	0101	0102	0104	0106	0108
60	0110	0112	0113	0115	0117	0119	0121	0123	0124	0126
70	0128	0130	0132	0134	0135	0137	0139	0141	0143	0144
80	0146	0148	0150	0152	0154	0155	0157	0159	0161	0163
90	0165	0166	0168	0170	0172	0174	0176	0177	0179	0181
100	0183	0185	0187	0188	0190	0192	0194	0196	0198	0199
110	0201	0203	0205	0207	0208	0210	0212	0214	0216	0128
120	0219	0221	0223	0225	0227	0229	0230	0232	0234	0236
130	0238	0240	0241	0243	0245	0247	0249	0251	0252	0254
140	0256	0258	0260	0262	0263	0265	0267	0269	0271	0272
150	0274	0276	0278	0280	0282	0283	0285	0287	0289	0291
160	0293	0294	0296	0298	0300	0302	0304	0305	0307	0309
170	0311	0313	0315	0316	0318	0320	0322	0324	0326	0327
180	0329	0331	0333	0335	0336	0338	0340	0342	0344	0346
190	0347	0349	0351	0353	0355	0357	0358	0360	0362	0364
200	0366	0368	0369	0371	0373	0375	0377	0379	0380	0382
210	0384	0386	0388	0390	0391	0393	0395	0397	0399	0401
220	0402	0404	0406	0408	0410	0411	0413	0415	0417	0419
230	0421	0422	0424	0426	0428	0430	0432	0433	0435	0437
240	0439	0441	0443	0444	0446	0448	0450	0452	0454	0455
250	0457	0459	0461	0463	0465	0466	0468	0470	0472	0474
260	0475	0477	0479	0481	0483	0485	0486	0488	0490	0492
270	0494	0496	0497	0499	0501	0503	0505	0507	0508	0510
280	0512	0514	0516	0518	0519	0521	0523	0525	0527	0529
290	0530	0532	0534	0536	0538	0539	0541	0543	0545	0547

TABLE 5 (Cont'd)

Depth

Conversion from fathoms to meters
(1 fathom = 1.8288 meters)

Fathoms	00	10	20	30	40	50	60	70	80	90
300	0549	0567	0585	0604	0622	0640	0658	0677	0695	0713
400	0732	0750	0768	0786	0805	0823	0841	0860	0878	0896
500	0914	0933	0951	0969	0988	1006	1024	1042	1061	1079
600	1097	1116	1134	1152	1170	1189	1207	1225	1244	1262
700	1280	1298	1317	1335	1353	1372	1390	1408	1426	1445
800	1463	1481	1500	1518	1536	1554	1573	1591	1609	1628
900	1646	1664	1682	1701	1719	1737	1756	1774	1792	1811

Fathoms	000	100	200	300	400	500	600	700	800	900
1000	1829	2012	2195	2377	2560	2743	2926	3109	3292	3475
2000	3658	3840	4023	4206	4389	4572	4755	4938	5121	5304
3000	5486	5669	5852	6035	6218	6401	6584	6767	6949	7132
4000	7315	7498	7681	7864	8047	8230	8412	8595	8778	8961
5000	9144	9327	9510	9693	9876	10058	10241	10424	10607	10790

TABLE 6

Depth

Conversion from feet to meters (tenths)
(1 foot = 0.3048 meter)

Feet	0	1	2	3	4	5	6	7	8	9
00	0.0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7
10	3.0	3.4	3.7	4.0	4.3	4.6	4.9	5.2	5.5	5.8
20	6.1	6.4	6.7	7.0	7.3	7.6	7.9	8.2	8.5	8.8
30	9.1	9.4	9.8	10.1	10.4	10.7	11.0	11.3	11.6	11.9
40	12.2	12.5	12.8	13.1	13.4	13.7	14.0	14.3	14.6	14.9
50	15.2	15.5	15.8	16.2	16.5	16.8	17.1	17.4	17.7	18.0
60	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0
70	21.3	21.6	21.9	22.3	22.6	22.9	23.2	23.5	23.8	24.1
80	24.4	24.7	25.0	25.3	25.6	25.9	26.2	26.5	26.8	27.1
90	27.4	27.7	28.0	28.3	28.7	29.0	29.3	29.6	29.9	30.2
100	30.5	30.8	31.1	31.4	31.7	32.0	32.3	32.6	32.9	33.2
110	33.5	33.8	34.1	34.4	34.7	35.1	35.4	35.7	36.0	36.3
120	36.6	36.9	37.2	37.5	37.8	38.1	38.4	38.7	39.0	39.3
130	39.6	39.9	40.2	40.5	40.8	41.1	41.5	41.8	42.1	42.4
140	42.7	43.0	43.3	43.6	43.9	44.2	44.5	44.8	45.1	45.4
150	45.7	46.0	46.3	46.6	46.9	47.2	47.5	47.9	48.2	48.5
160	48.8	49.1	49.4	49.7	50.0	50.3	50.6	50.9	51.2	51.5
170	51.8	52.1	52.4	52.7	53.0	53.3	53.6	53.9	54.3	54.6
180	54.9	55.2	55.5	55.8	56.1	56.4	56.7	57.0	57.3	57.6
190	57.9	58.2	58.5	58.8	59.1	59.4	59.7	60.0	60.4	60.7
200	61.0	61.3	61.6	61.9	62.2	62.5	62.8	63.1	63.4	63.7
210	64.0	64.3	64.6	64.9	65.2	65.5	65.8	66.1	66.4	66.8
220	67.1	67.4	67.7	68.0	68.3	68.6	68.9	69.2	69.5	69.8
230	70.1	70.4	70.7	71.0	71.3	71.6	71.9	72.2	72.5	72.8
240	73.2	73.5	73.8	74.1	74.4	74.7	75.0	75.3	75.6	75.9
250	76.2	76.5	76.8	77.1	77.4	77.7	78.0	78.3	78.6	78.9
260	79.2	79.6	79.9	80.2	80.5	80.8	81.1	81.4	81.7	82.0
270	82.3	82.6	82.9	83.2	83.5	83.8	84.1	84.4	84.7	85.0
280	85.3	85.6	86.0	86.3	86.6	86.9	87.2	87.5	87.8	88.1
290	88.4	88.7	89.0	89.3	89.6	89.9	90.2	90.5	90.8	91.1

TABLE 6 (Cont'd)

Conversion from feet to meters (tenths)
(1 foot = 0.3048 meter)

Feet	00	10	20	30	40	50	60	70	80	90
300	91.4	94.5	97.5	100.6	103.6	106.7	109.7	112.8	115.8	118.9
400	121.9	125.0	128.0	131.1	134.1	137.2	140.2	143.3	146.3	149.4
500	152.4	155.4	158.5	161.5	164.6	167.6	170.7	173.7	176.8	179.8
600	182.9	185.9	189.0	192.0	195.1	198.1	201.2	204.2	207.3	210.3
700	213.4	216.4	219.5	222.5	225.6	228.6	231.6	234.7	237.7	240.8
800	243.8	246.9	249.9	253.0	256.0	259.1	262.1	265.2	268.2	271.3
900	274.3	277.4	280.4	283.5	286.5	289.6	292.6	295.7	298.7	301.8
1000	304.8	307.8	310.9	313.9	317.0	320.0	323.1	326.1	329.2	332.2
1100	335.3	338.3	341.4	344.4	347.5	350.5	353.6	356.6	359.7	362.7
1200	365.8	368.8	371.9	374.9	378.0	381.0	384.0	387.1	390.1	393.2
1300	396.2	399.3	402.3	405.3	408.4	411.5	414.5	417.6	420.6	423.7
1400	426.7	429.8	432.8	435.9	438.9	442.0	445.0	448.1	451.1	454.2
1500	457.2	460.2	563.3	466.3	469.4	472.4	475.5	478.5	481.6	484.6
1600	487.7	490.7	493.8	496.8	499.9	502.9	506.0	509.0	512.1	515.1
1700	518.2	521.2	524.3	527.3	530.4	533.4	536.4	539.5	542.5	545.6
1800	548.6	551.7	554.7	557.8	560.8	563.9	566.9	570.0	573.0	576.1
1900	579.1	582.2	585.2	588.3	591.3	594.4	597.4	600.5	603.5	606.6
2000	609.6	612.6	615.7	618.7	621.8	624.8	627.9	630.9	634.0	637.0
2100	640.1	643.1	646.2	649.2	652.3	655.3	658.4	661.4	664.5	667.5
2200	670.6	673.6	676.7	679.7	682.8	685.8	688.8	691.9	694.9	698.0
2300	701.0	704.1	707.1	710.2	713.2	716.3	719.3	722.4	725.4	728.5
2400	731.5	734.6	737.6	740.7	743.7	746.8	749.8	752.9	755.9	759.0
2500	762.0	765.0	768.1	771.1	774.2	777.2	780.3	783.3	786.4	789.4
2600	792.5	795.5	798.6	801.6	804.7	807.7	810.8	813.8	816.9	819.9
2700	823.0	826.0	829.1	832.1	835.2	838.2	841.2	844.3	847.3	850.4
2800	853.4	856.5	859.5	862.6	865.6	868.7	871.7	874.8	877.8	880.9
2900	883.9	887.0	890.0	893.1	896.1	899.2	902.2	905.3	908.3	911.4
3000	914.4	917.4	920.5	923.5	926.6	929.6	932.7	935.7	938.8	941.8
3100	944.9	947.9	951.0	954.0	957.1	960.1	963.2	966.2	969.3	972.3
3200	975.4	978.4	981.5	984.5	987.6	990.6	993.6	996.7	999.7	1002.8

TABLE 7

Additional Observations

<u>This table is to be added later.</u>

TABLE 8

Water Color

Forel-Ule scale and conversions from other color scales

Percent Yellow	Percent Brown	Forel-Ule Scale	Code
0		I	01
2		II	02
5		III	03
9		IV	04
14		V	05
20		VI	06
27		VII	07
35		VIII	08
44		IX	09
54		X	10
65	0	XI	11
	2	XII	12
	5	XIII	13
	9	XIV	14
	14	XV	15
	20	XVI	16
	27	XVII	17
	35	XVIII	18
	44	XIX	19
	54	XX	20
	65	XXI	21

TABLE 9

Direction

In tens of degrees from which waves and/or winds are coming

Code		Code	
00	Calm (no waves – no motion)	22	215° – 224°
01	5° – 14°	23	225° – 234°
02	15° – 24°	24	235° – 244°
03	25° – 34°	25	245° – 254°
04	35° – 44°	26	255° – 264°
05	45° – 54°	27	265° – 274°
06	55° – 64°	28	275° – 284°
07	65° – 74°	29	285° – 294°
08	75° – 84°	30	295° – 304°
09	85° – 94°	31	305° – 314°
10	95° – 104°	32	315° – 324°
11	105° – 114°	33	325° – 334°
12	115° – 124°	34	335° – 344°
13	125° – 134°	35	345° – 354°
14	135° – 144°	36	355° – 4°
15	145° – 154°		
16	155° – 164°	49	Waves confused, direction indeterminate (waves equal to or less than $4\frac{3}{4}$ metres)
17	165° – 174°		
18	175° – 184°		
19	185° – 194°	99	Waves confused, direction indeterminate (waves greater than $4\frac{3}{4}$ metres)
20	195° – 204°		Winds variable, or all directions or unknown
21	205° – 214°		

Table 9 is a combination of WMO Codes 0885 and 0877.

TABLE 10

Direction

Conversion from points, quarter points, or a scale of 32, to a scale of 36 points

POINTS	QUARTER POINTS	0-32	CODE	POINTS	QUARTER POINTS	0-32	CODE
N x E	N6E to N14E	1	01	S x W	S6W to S14W	17	19
NNE	N15E to N25E	2	02	SSW	S15W to S25W	18	20
NE x N	N26E to N34E	3	03	SW x S	S26W to S34W	19	21
NE	N35E to N45E	4	04	SW	S35W to S45W	20	22
	N46E to N54E		05		S46W to S54W		23
NE x E	N55E to N65E	5	06	SW x W	S55W to S65W	21	24
ENE	N66E to N74E	6	07	WSW	S66W to S74W	22	25
E x N	N75E to N85E	7	08	W x S	S75W to S85W	23	26
	N86E to N89E		09		S86W to S89W		27
E	E	8	09	W	W	24	27
	S89E to S86E		09		N89W to N86W		27
E x S	S85E to S75E	9	10	W x N	N85W to N75W	25	28
ESE	S74E to S66E	10	11	WNW	N74W to N66W	26	29
SE x E	S65E to S55E	11	12	NW x W	N65W to N55W	27	30
	S54E to S46E		13		N54W to N46W		31
SE	S45E to S35E	12	14	NW	N45W to N35W	28	32
SE x S	S34E to S26E	13	15	NW x N	N34W to N26W	29	33
SSE	S25E to S15E	14	16	NNW	N25W to N15W	30	34
S x E	S14E to S6E	15	17	N x W	N14W to N6W	31	35
	S5E to S1E		18		N5W to N1W		36
S	S	16	18	N	N	32	36
	S1W to S5W		18		N1E to N5E		36
				Variable			99

TABLE 11

Height

WMO Code 1555 for recording height of the dominant waves

Code		Code	If 50 is added to direction
0	Less than $^1/_4$ m (1 ft)	0	5 m (16 ft)
1	$^1/_2$ m (1 $^1/_2$ ft)	1	5 $^1/_2$ m (17 $^1/_2$ ft)
2	1 m (3 ft)	2	6 m (19 ft)
3	1 $^1/_2$ m (5 ft)	3	6 $^1/_2$ m (21 ft)
4	2 m (6 $^1/_2$ ft)	4	7 m (22 $^1/_2$ ft)
5	2 $^1/_2$ m (8 ft)	5	7 $^1/_2$ m (24 ft)
6	3 m (9 $^1/_2$ ft)	6	8 m (25 $^1/_2$ ft)
7	3 $^1/_2$ m (11 ft)	7	8 $^1/_2$ m (27 ft)
8	4 m (13 ft)	8	9 m (29 ft)
9	4 $^1/_2$ m (14 ft)	9	9 $^1/_2$ m (30 $^1/_2$ ft)
x	Height not determined		

Notes :

(1) Each code figure provides for reporting a range of heights. For example : $1 = ^1/_4$ m (1 ft) to $^3/_4$ m ($2^1/_2$ ft) ; $5 = 2^1/_4$ m (7 ft) to $2^3/_4$ m (9 ft) ; $9 = 4^1/_4$ m ($13^1/_2$ ft) to $4^3/_4$ m (15 ft), etc.

(2) If a wave height comes exactly midway between the heights corresponding to two code figures, the lower code figure is reported ; e.g. a height of $2^3/_4$ m is reported by code figure 5.

(3) In aeronautical forecast codes, only the left-hand table is to be used and code figure 9 has the meaning : $4^1/_2$ m (14 ft) or more.

(4) The average value of the wave height (vertical distance between trough and crest) is reported, as obtained from the larger well formed waves of the wave system being observed.

TABLE 12

Period

WMO Code 3155 for recording period of dominant waves

Code

2	5 seconds or less
3	6 or 7 seconds
4	8 or 9 seconds
5	10 or 11 seconds
6	12 or 13 seconds
7	14 or 15 seconds

Code

8	16 or 17 seconds
9	18 or 19 seconds
0	20 or 21 seconds
1	Over 21 seconds
x	Calm, or period not determined

Notes:

(1) The period of the waves is the time between the passage of two successive wave crests past a fixed point (it is equal to the wave length divided by the wave speed).

(2) The average value of the wave period is reported, as obtained from the larger well-formed waves of the wave system being observed.

TABLE 13

Sea State

WMO Code 3700 for Recording Sea State

| Description | Height ($\dagger$) | | Code |
	Feet*	Meters	
Calm-glassy	0	0	0
Calm-rippled	$0 - \frac{1}{3}$	0 - 0.1	1
Smooth-wavelet	$\frac{1}{3} - 1\frac{2}{3}$	0.1 - 0.5	2
Slight	$1\frac{2}{3} - 4$	0.5 - 1.25	3
Moderate	4 - 8	1.25 - 2.5	4
Rough	8 - 13	2.5 - 4	5
Very rough	13 - 20	4 - 6	6
High	20 - 30	6 - 9	7
Very high	30 - 45	9 - 14	8
Phenomenal	> 45	> 14	9

($\dagger$) The average wave height as obtained from the larger well-formed waves of the wave system being observed.

*   The exact bounding height is to be assigned for the lower code figure, e.g. a height of 4 meters is coded as 5.

40

TABLE 14

Wind Speed

Conversion from meters per second to knots
(1m/sec = 1.94254 knots)

m/sec	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
knots	0	0	0	1	1	1	1	1	2	2

m/sec	00	01	02	03	04	05	06	07	08	09
00	00	02	04	06	08	10	12	14	16	17
10	19	21	23	25	27	29	31	33	35	37
20	39	41	43	45	47	49	51	52	54	56
30	58	60	62	64	66	68	70	72	74	76
40	78	80	82	84	85	87	89	91	93	95
50	97	99	101	103	105	107	109	111	113	115

TABLE 15

Wind Speed

Conversion from miles per hour to knots
(1 mph = 0.86839 knot)

mph	00	01	02	03	04	05	06	07	08	09
00	00	01	02	03	03	04	05	06	07	08
10	09	10	10	11	12	13	14	15	16	16
20	17	18	19	20	21	22	23	23	24	25
30	26	27	28	29	30	30	31	32	33	34
40	35	36	36	37	38	39	40	41	42	43
50	43	44	45	46	47	48	49	49	50	51
60	52	53	54	55	56	56	57	58	59	60
70	61	62	63	63	64	65	66	67	68	69
80	69	70	71	72	73	74	75	76	76	77
90	78	79	80	81	82	82	83	84	85	86
100	87	88	89	89	90	91	92	93	94	95
110	96	96	97	98	99	100	101	102	102	103

TABLE 16

Wind Speed

Conversion from kilometers per hour to knots
(1 km/hr = 0.539593 knot)

km/hr	00	01	02	03	04	05	06	07	08	09
00	00	01	01	02	02	03	03	04	04	05
10	05	06	06	07	08	08	09	09	10	10
20	11	11	12	12	13	13	14	15	15	16
30	16	17	17	18	18	19	19	20	21	21
40	22	22	23	23	24	24	25	25	26	26
50	27	28	28	29	29	30	30	31	31	32
60	32	33	33	34	35	35	36	36	37	37
70	38	38	39	39	40	40	41	42	42	43
80	43	44	44	45	45	46	46	47	47	48
90	49	49	50	50	51	51	52	52	53	53
100	54	54	55	56	56	57	57	58	58	59
110	59	60	60	61	62	62	63	63	64	64
120	65	65	66	66	67	67	68	69	69	70
130	70	71	71	72	72	73	73	74	74	75
140	76	76	77	77	78	78	79	79	80	80
150	81	81	82	83	83	84	84	85	85	86
160	86	87	87	88	88	89	90	90	91	91
170	92	92	93	93	94	94	95	96	96	97
180	97	98	98	99	99	100	100	101	101	102

TABLE 17

Wind Speed

Conversion from feet per second to knots
$(1 \text{ ft/sec} = 0.5921 \text{ knot})$

ft/sec	00	01	02	03	04	05	06	07	08	09
00	00	01	01	02	02	03	04	04	05	05
10	06	07	07	08	08	09	09	10	11	11
20	12	12	13	14	14	15	15	16	17	17
30	18	18	19	20	20	21	21	22	22	23
40	24	24	25	25	26	27	27	28	28	29
50	30	30	31	31	32	33	33	34	34	35
60	36	36	37	37	38	38	39	40	40	41
70	41	42	43	43	44	44	45	46	46	47
80	47	48	49	49	50	50	51	52	52	53
90	53	54	54	55	56	56	57	57	58	59
100	59	60	60	61	62	62	63	63	64	65
110	65	66	66	67	67	68	69	69	70	70
120	71	72	72	73	73	74	75	75	76	76
130	77	78	78	79	79	80	81	81	82	82
140	83	83	84	85	85	86	86	87	88	88
150	89	89	90	91	91	92	92	93	94	94
160	95	95	96	97	97	98	98	99	99	100

TABLE 18

Wind Force

Conversion from knots, meters per second, kilometers per
hour, and miles per hour to the Beaufort wind scale

CODE	DESCRIPTIVE TERM	VELOCITY EQUIVALENT AT A STANDARD HEIGHT OF 10 METERS ABOVE OPEN FLAT GROUND			
		mean velocity in knots	meters/sec	km/h	m.p.h.
0	Calm	< 1	0 – 0.2	< 1	< 1
1	Light air	1 – 3	0.3 – 1.5	1 – 5	1 – 3
2	Light breeze	4 – 6	1.6 – 3.3	6 – 11	4 – 7
3	Gentle breeze	7 – 10	3.4 – 5.4	12 – 19	8 – 12
4	Moderate breeze	11 – 16	5.5 – 7.9	20 – 28	13 – 18
5	Fresh breeze	17 – 21	8.0 – 10.7	29 – 38	19 – 24
6	Strong breeze	22 – 27	10.8 – 13.8	39 – 49	25 – 31
7	Near gale	28 – 33	13.9 – 17.1	50 – 61	32 – 38
8	Gale	34 – 40	17.2 – 20.7	62 – 74	39 – 46
9	Strong gale	41 – 47	20.8 – 24.4	75 – 88	47 – 54
10	Storm	48 – 55	24.5 – 28.4	89 – 102	55 – 63
11	Violent storm	56 – 63	28.5 – 32:6	103 – 117	64 – 72
12	Hurricane	64 – 71	32.7 – 36.9	118 – 133	73 – 82
13	—	72 – 80	37.0 – 41.4	134 – 149	83 – 92
14	—	81 – 89	41.5 – 46.1	150 – 166	93 – 103
15	—	90 – 99	46.2 – 50.9	167 – 183	104 – 114
16	—	100 – 108	51.0 – 56.0	184 – 201	115 – 125
17	—	109 – 118	56.1 – 61.2	202 – 220	126 – 136

TABLE 19

Atmospheric Pressure

Conversion from inches of mercury to millibars*
(1 inch of H_g = 33.8639 mbs)

Inches	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
27.9	44.8	45.1	45.5	45.8	46.2	46.5	46.8	47.2	47.5	47.9
28.0	48.2	48.5	48.9	49.2	49.5	49.9	50.2	50.6	50.9	51.2
28.1	51.6	51.9	52.3	52.6	52.9	53.3	53.6	53.9	54.3	54.6
28.2	55.0	55.3	55.6	56.0	56.3	56.7	57.0	57.3	57.7	58.0
28.3	58.3	58.7	59.0	59.4	59.7	60.0	60.4	60.7	61.1	61.4
28.4	61.7	62.1	62.4	62.8	63.1	63.4	63.8	64.1	64.4	64.8
28.5	65.1	65.5	65.8	66.1	66.5	66.8	67.2	67.5	67.8	68.2
28.6	68.5	68.8	69.2	69.5	69.9	70.2	70.5	70.9	71.2	71.6
28.7	71.9	72.2	72.6	72.9	73.2	73.6	73.9	74.3	74.6	74.9
28.8	75.3	75.6	76.0	76.3	76.6	77.0	77.3	77.7	78.0	78.3
28.9	78.7	79.0	79.3	79.7	80.0	80.4	80.7	81.0	81.4	81.7
29.0	82.1	82.4	82.7	83.1	83.4	83.7	84.1	84.4	84.8	85.1
29.1	85.4	85.8	86.1	86.5	86.8	87.1	87.5	87.8	88.1	88.5
29.2	88.8	89.2	89.5	89.8	90.2	90.5	90.9	91.2	91.5	91.9
29.3	92.2	92.6	92.9	93.2	93.6	93.9	94.2	94.6	94.9	95.3
29.4	95.6	95.9	96.3	96.6	97.0	97.3	97.6	98.0	98.3	98.6
29.5	99.0	99.3	99.7	00.0	00.3	00.7	01.0	01.4	01.7	02.0
29.6	02.4	02.7	03.0	03.4	03.7	04.1	04.4	04.7	05.1	05.4
29.7	05.8	06.1	06.4	06.8	07.1	07.5	07.8	08.1	08.5	08.8
29.8	09.1	09.5	09.8	10.2	10.5	10.8	11.2	11.5	11.9	12.2
29.9	12.5	12.9	13.2	13.5	13.9	14.2	14.6	14.9	15.2	15.6
30.0	15.9	16.3	16.6	16.9	17.3	17.6	17.9	18.3	18.6	19.0
30.1	19.3	19.6	20.0	20.3	20.7	21.0	21.3	21.7	22.0	22.4
30.2	22.7	23.0	23.4	23.7	24.0	24.4	24.7	25.1	25.4	25.7
30.3	26.1	26.4	26.8	27.1	27.4	27.8	28.1	28.4	28.8	29.1
30.4	29.5	29.8	30.1	30.5	30.8	31.2	31.5	31.8	32.2	32.5
30.5	32.8	33.2	33.5	33.9	34.2	34.5	34.9	35.2	35.6	35.9
30.6	36.2	36.6	36.9	37.3	37.6	37.9	38.3	38.6	38.9	39.3
30.7	39.6	40.0	40.3	40.6	41.0	41.3	41.7	42.0	42.3	42.7
30.8	43.0	43.3	43.7	44.0	44.4	44.7	45.0	45.4	45.7	46.1
30.9	46.4	46.7	47.1	47.4	47.7	48.1	48.4	48.8	49.1	49.4
31.0	49.8	50.1	50.5	50.8	51.1	51.5	51.8	52.2	52.5	52.8

*The hundreds and thousands digits are not recorded; the true range of this table is 944.8 - 1052.8 mbs.

TABLE 20

Atmospheric Pressure

Conversion from millimeters of mercury to millibars*
(1 mm of Hg = 1.33322 mbs)

mm of Hg	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
708	43.9	44.1	44.2	44.3	44.5	44.6	44.7	44.9	45.0	45.1
709	45.3	45.4	45.5	45.7	45.8	45.9	46.1	46.2	46.3	46.5
710	46.6	46.7	46.9	47.0	47.1	47.3	47.4	47.5	47.7	47.8
711	47.9	48.1	48.2	48.3	48.5	48.6	48.7	48.9	49.0	49.1
712	49.3	49.4	49.5	49.7	49.8	49.9	50.1	50.2	50.3	50.5
713	50.6	50.7	50.9	51.0	51.1	51.3	51.4	51.5	51.7	51.8
714	51.9	52.1	52.2	52.3	52.5	52.6	52.7	52.9	53.0	53.1
715	53.3	53.4	53.5	53.7	53.8	53.9	54.1	54.2	54.3	54.5
716	54.6	54.7	54.9	55.0	55.1	55.3	55.4	55.5	55.7	55.8
717	55.9	56.1	56.2	56.3	56.5	56.6	56.7	56.9	57.0	57.1
718	57.3	57.4	57.5	57.7	57.8	57.9	58.1	58.2	58.3	58.5
719	58.6	58.7	58.9	59.0	59.1	59.3	59.4	59.5	59.7	59.8
720	59.9	60.1	60.2	60.3	60.5	60.6	60.7	60.9	61.0	61.1
721	61.3	61.4	61.5	61.7	61.8	61.9	62.1	62.2	62.3	62.5
722	62.6	62.7	62.9	63.0	63.1	63.3	63.4	63.5	63.7	63.8
723	63.9	64.1	64.2	64.3	64.5	64.6	64.7	64.9	65.0	65.1
724	65.3	65.4	65.5	65.7	65.8	65.9	66.1	66.2	66.3	66.5
725	66.6	66.7	66.9	67.0	67.1	67.3	67.4	67.5	67.7	67.8
726	67.9	68.1	68.2	68.3	68.5	68.6	68.7	68.9	69.0	69.1
727	69.3	69.4	69.5	69.7	69.8	69.9	70.1	70.2	70.3	70.5
728	70.6	70.7	70.9	71.0	71.1	71.3	71.4	71.5	71.7	71.8
729	71.9	72.1	72.2	72.3	72.5	72.6	72.7	72.9	73.0	73.1
730	73.3	73.4	73.5	73.7	73.8	73.9	74.1	74.2	74.3	74.5
731	74.6	74.7	74.9	75.0	75.1	75.3	75.4	75.5	75.7	75.8
732	75.9	76.1	76.2	76.3	76.5	76.6	76.7	76.9	77.0	77.1
733	77.3	77.4	77.5	77.7	77.8	77.9	78.1	78.2	78.3	78.5
734	78.6	78.7	78.9	79.0	79.1	79.3	79.4	79.5	79.7	79.8
735	79.9	80.1	80.2	80.3	80.5	80.6	80.7	80.9	81.0	81.1

*The hundreds digit is not recorded. The true range of this part of Table 20 is 943.9 mbs - 981.1 mbs.

TABLE 20 (Cont'd)

Atmospheric Pressure

Conversion from millimeters of mercury to millibars* (Cont'd)
(1 mm of Hg = 1.33322 mbs)

mm of Hg	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
736	81.3	81.4	81.5	81.7	81.8	81.9	82.1	82.2	82.3	82.5
737	82.6	82.7	82.9	83.0	83.1	83.3	83.4	83.5	83.7	83.8
738	83.9	84.1	84.2	84.3	84.5	84.6	84.7	84.9	85.0	85.1
739	85.3	85.4	85.5	85.7	85.8	85.9	86.1	86.2	86.3	86.5
740	86.6	86.7	86.9	87.0	87.1	87.3	87.4	87.5	87.7	87.8
741	87.9	88.1	88.2	88.3	88.5	88.6	88.7	88.9	89.0	89.1
742	89.3	89.4	89.5	89.7	89.8	89.9	90.1	90.2	90.3	90.5
743	90.6	90.7	90.9	91.0	91.1	91.3	91.4	91.5	91.7	91.8
744	91.9	92.1	92.2	92.3	92.5	92.6	92.7	92.9	93.0	93.1
745	93.3	93.4	93.5	93.7	93.8	93.9	94.1	94.2	94.3	94.5
746	94.6	94.7	94.9	95.0	95.1	95.3	95.4	95.5	95.7	95.8
747	95.9	96.1	96.2	96.3	96.5	96.6	96.7	96.9	97.0	97.1
748	97.3	97.4	97.5	97.7	97.8	97.9	98.1	98.2	98.3	98.5
749	98.6	98.7	98.9	99.0	99.1	99.3	99.4	99.5	99.7	99.8
750	99.9	00.1	00.2	00.3	00.5	00.6	00.7	00.9	01.0	01.1
751	01.3	01.4	01.5	01.7	01.8	01.9	02.1	02.2	02.3	02.5
752	02.6	02.7	02.9	03.0	03.1	03.3	03.4	03.5	03.7	03.8
753	03.9	04.1	04.2	04.3	04.5	04.6	04.7	04.9	05.0	05.1
754	05.3	05.4	05.5	05.7	05.8	05.9	06.1	06.2	06.3	06.5
755	06.6	06.7	06.9	07.0	07.1	07.3	07.4	07.5	07.7	07.8
756	07.9	08.1	08.2	08.3	08.5	08.6	08.7	08.9	09.0	09.1
757	09.3	09.4	09.5	09.7	09.8	09.9	10.1	10.2	10.3	10.5
758	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8
759	11.9	12.1	12.2	12.3	12.5	12.6	12.7	12.9	13.0	13.1
760	13.3	13.4	13.5	13.7	13.8	13.9	14.1	14.2	14.3	14.5
761	14.6	14.7	14.9	15.0	15.1	15.3	15.4	15.5	15.7	15.8
762	15.9	16.1	16.2	16.3	16.4	16.6	16.7	16.8	17.0	17.1
763	17.2	17.4	17.5	17.6	17.8	17.9	18.0	18.2	18.3	18.4
764	18.6	18.7	18.8	19.0	19.1	19.2	19.4	19.5	19.6	19.8
765	19.9	20.0	20.2	20.3	20.4	20.6	20.7	20.8	21.0	21.1

*The hundreds and thousands digits are not recorded. The true
range of this part of Table 20 is 981.3 mbs - 1021.1 mbs.

TABLE 20 (Cont'd)

Atmospheric Pressure

Conversion from millimeters of mercury to millibars* (Cont'd)
(1 mm of Hg = 1.33322 mbs)

mm of Hg	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
766	21.2	21.4	21.5	21.6	21.8	21.9	22.0	22.2	22.3	22.4
767	22.6	22.7	22.8	23.0	23.1	23.2	23.4	23.5	23.6	23.8
768	23.9	24.0	24.2	24.3	24.4	24.6	24.7	24.8	25.0	25.1
769	25.2	25.4	25.5	25.6	25.8	25.9	26.0	26.2	26.3	26.4
770	26.6	26.7	26.8	27.0	27.1	27.2	27.4	27.5	27.6	27.8
771	27.9	28.0	28.2	28.3	28.4	28.6	28.7	28.8	29.0	29.1
772	29.2	29.4	29.5	29.6	29.8	29.9	30.0	30.2	30.3	30.4
773	30.6	30.7	30.8	31.0	31.1	31.2	31.4	31.5	31.6	31.8
774	31.9	32.0	32.2	32.3	32.4	32.6	32.7	32.8	33.0	33.1
775	33.2	33.4	33.5	33.6	33.8	33.9	34.0	34.2	34.3	34.4
776	34.6	34.7	34.8	35.0	35.1	35.2	35.4	35.5	35.6	35.8
777	35.9	36.0	36.2	36.3	36.4	36.6	36.7	36.8	37.0	37.1
778	37.2	37.4	37.5	37.6	37.8	37.9	38.0	38.2	38.3	38.4
779	38.6	38.7	38.8	39.0	39.1	39.2	39.4	39.5	39.6	39.8
780	39.9	40.0	40.2	40.3	40.4	40.6	40.7	40.8	41.0	41.1
781	41.2	41.4	41.5	41.6	41.8	41.9	42.0	42.2	42.3	42.4
782	42.6	42.7	42.8	43.0	43.1	43.2	43.4	43.5	43.6	43.8
783	43.9	44.0	44.2	44.3	44.4	44.6	44.7	44.8	45.0	45.1
784	45.2	45.4	45.5	45.6	45.8	45.9	46.0	46.2	46.3	46.4
785	46.6	46.7	46.8	47.0	47.1	47.2	47.4	47.5	47.6	47.8
786	47.9	48.0	48.2	48.3	48.4	48.6	48.7	48.8	49.0	49.1
787	49.2	49.4	49.5	49.6	49.8	49.9	50.0	50.2	50.3	50.4

*The hundreds and thousands digits are not recorded. The true
range of this part of Table 20 is 1021.2 mbs. - 1050.4 mbs.

TABLE 21

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
130	54.4	54.5	54.6	54.6	54.7	54.7	54.8	54.8	54.9	54.9
129	53.9	53.9	54.0	54.1	54.1	54.2	54.2	54.3	54.3	54.4
128	53.3	53.4	53.5	53.6	53.6	53.6	53.7	53.7	53.8	53.8
127	52.8	52.8	52.9	52.9	53.0	53.1	53.1	53.2	53.2	53.3
126	52.2	52.3	52.3	52.4	52.4	52.5	52.6	52.6	52.7	52.7
125	51.7	51.7	51.8	51.8	51.9	51.9	52.0	52.1	52.1	52.2
124	51.1	51.2	51.2	51.3	51.3	51.4	51.4	51.5	51.6	51.6
123	50.6	50.6	50.7	50.7	50.8	50.8	50.9	50.9	51.0	51.1
122	50.0	50.1	50.1	50.2	50.2	50.3	50.3	50.4	50.4	50.5
121	49.4	49.5	49.6	49.6	49.7	49.7	49.8	49.8	49.9	49.9
120	48.9	48.9	49.0	49.1	49.1	49.2	49.2	49.3	49.3	49.4
119	48.3	48.4	48.4	48.5	48.6	48.6	48.7	48.7	48.8	48.8
118	47.8	47.8	47.9	47.9	48.0	48.1	48.1	48.2	48.2	48.3
117	47.2	47.3	47.3	47.4	47.4	47.5	47.6	47.6	47.7	47.7
116	46.7	46.7	46.8	46.8	46.9	46.9	47.0	47.1	47.1	47.2
115	46.1	46.2	46.2	46.3	46.3	46.4	46.4	46.5	46.6	46.6
114	45.6	45.6	45.7	45.7	45.8	45.8	45.9	45.9	46.0	46.1
113	45.0	45.1	45.1	45.2	45.2	45.3	45.3	45.4	45.4	45.5
112	44.4	44.5	44.6	44.7	44.7	44.7	44.8	44.8	44.9	44.9
111	43.9	43.9	44.0	44.1	44.1	44.2	44.2	44.3	44.3	44.4
110	43.3	43.4	43.4	43.5	43.6	43.6	43.7	43.7	43.8	43.8
109	42.8	42.8	42.9	43.9	43.0	43.1	43.1	43.2	43.2	43.3
108	42.2	42.3	42.3	42.4	42.4	42.5	42.6	42.6	42.7	42.7
107	41.7	41.7	41.8	41.8	41.9	41.9	42.0	42.1	42.1	42.2
106	41.1	41.2	41.2	41.3	41.3	41.4	41.4	41.5	41.6	41.6
105	40.6	40.6	40.7	40.7	40.8	40.8	40.9	40.9	41.0	41.1
104	40.0	40.1	40.1	40.2	40.2	40.3	40.3	40.4	40.4	40.5

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
103	39.4	39.5	39.6	39.6	39.7	39.7	39.8	39.8	39.9	39.9
102	38.9	38.9	39.0	39.1	39.1	39.2	39.2	39.3	39.3	39.4
101	38.3	38.4	38.4	38.5	38.6	38.6	38.7	38.7	38.8	38.8
100	37.8	37.8	37.9	37.9	38.0	38.1	38.1	38.2	38.2	38.3
99	37.2	37.3	37.3	37.4	37.4	37.5	37.6	37.6	37.7	37.7
98	36.7	36.7	36.8	36.8	36.9	36.9	37.0	37.1	37.1	37.2
97	36.1	36.2	36.2	36.2	36.3	36.4	36.4	36.5	36.6	36.6
96	35.6	35.6	35.7	35.7	35.8	35.8	35.9	35.9	36.0	36.1
95	35.0	35.1	35.1	35.2	35.2	35.3	35.3	35.4	35.4	35.5
94	34.4	34.5	34.6	34.6	34.7	34.7	34.8	34.8	34.9	34.9
93	33.9	33.9	34.0	34.1	34.1	34.2	34.2	34.3	34.3	34.4
92	33.3	33.4	33.4	33.5	33.6	33.6	33.7	33.7	33.8	33.8
91	32.8	32.8	32.9	32.9	33.0	33.1	33.1	33.2	33.2	33.3
90	32.2	32.3	32.3	32.4	32.4	32.5	32.6	32.6	32.7	32.7
89	31.7	31.7	31.8	31.8	31.9	31.9	32.0	32.1	32.1	32.2
88	31.1	31.2	31.2	31.3	31.3	31.4	31.4	31.5	31.6	31.6
87	30.6	30.6	30.7	30.7	30.8	30.8	30.9	30.9	31.0	31.1
86	30.0	30.1	30.1	30.2	30.2	30.3	30.3	30.4	30.4	30.5
85	29.4	29.5	29.6	29.6	29.7	29.7	29.8	29.8	29.9	29.9
84	28.9	28.9	29.0	29.1	29.1	29.2	29.2	29.3	29.3	29.3
83	28.3	28.4	28.4	28.5	28.6	28.6	28.7	28.7	28.8	28.8
82	27.8	27.8	27.9	28.9	28.0	28.1	28.1	28.2	28.2	28.3
81	27.2	27.3	27.3	27.4	27.4	27.5	27.6	27.6	27.7	27.7
80	26.7	26.7	26.8	26.8	26.9	26.9	27.0	27.1	27.1	27.2
79	26.1	26.2	26.2	26.3	26.3	26.4	26.4	26.5	26.6	26.6
78	25.6	25.6	25.7	25.7	25.8	25.8	25.9	25.9	26.0	26.1
77	25.0	25.1	25.1	25.2	25.2	25.3	25.3	25.4	25.4	25.5

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
76	24.4	24.5	24.6	24.6	24.7	24.7	24.8	24.8	24.9	24.9
75	23.9	23.9	24.0	24.1	24.1	24.2	24.2	24.3	24.3	24.4
74	23.3	23.4	23.4	23.5	23.6	23.6	23.7	23.7	23.8	23.8
73	22.8	22.8	22.9	22.9	23.0	23.1	23.1	23.2	23.2	23.3
72	22.2	22.3	22.3	22.4	22.4	22.5	22.6	22.6	22.7	22.7
71	21.7	21.7	21.8	21.8	21.9	21.9	22.0	22.1	22.1	22.2
70	21.1	21.2	21.2	21.3	21.3	21.4	21.4	21.5	21.6	21.6
69	20.6	20.6	20.7	20.7	20.8	20.8	20.9	20.9	21.0	21.1
68	20.0	20.1	20.1	20.2	20.2	20.3	20.3	20.4	20.4	20.5
67	19.4	19.5	19.6	19.6	19.7	19.7	19.8	19.8	19.9	19.9
66	18.9	18.9	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.4
65	18.3	18.4	18.4	18.5	18.6	18.6	18.7	18.7	18.8	18.8
64	17.8	17.8	17.9	17.9	18.0	18.1	18.1	18.2	18.2	18.3
63	17.2	17.3	17.3	17.4	17.4	17.5	17.6	17.6	17.7	17.7
62	16.7	16.7	16.8	16.8	16.9	16.9	17.0	17.1	17.1	17.2
61	16.1	16.2	16.2	16.3	16.3	16.4	16.4	16.5	16.6	16.6
60	15.6	15.6	15.7	15.7	15.8	15.8	15.9	15.9	16.0	16.1
59	15.0	15.1	15.1	15.2	15.2	15.3	15.3	15.4	15.4	15.5
58	14.4	14.5	14.6	14.6	14.7	14.7	14.8	14.8	14.9	14.9
57	13.9	13.9	14.0	14.1	14.1	14.2	14.2	14.3	14.3	14.4
56	13.3	13.4	13.4	13.5	13.6	13.6	13.7	13.7	13.8	13.8
55	12.8	12.8	12.9	12.9	13.0	13.1	13.1	13.2	13.2	13.3
54	12.2	12.3	12.3	12.4	12.4	12.5	12.6	12.6	12.7	12.7
53	11.7	11.7	11.8	11.8	11.9	11.9	12.0	12.1	12.1	12.2
52	11.1	11.2	11.2	11.3	11.3	11.4	11.4	11.5	11.6	11.6
51	10.6	10.6	10.7	10.7	10.8	10.8	10.9	10.9	11.0	11.1
50	10.0	10.1	10.1	10.2	10.2	10.3	10.3	10.4	10.4	10.5

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
49	09.4	09.5	09.6	09.6	09.7	09.7	09.8	09.8	09.9	09.9
48	08.9	08.9	09.0	09.1	09.1	09.2	09.2	09.3	09.3	09.4
47	08.3	08.4	08.4	08.5	08.6	08.6	08.7	08.7	08.8	08.8
46	07.8	07.8	07.9	07.9	08.0	08.1	08.1	08.2	08.2	08.3
45	07.2	07.3	07.3	07.4	07.4	07.5	07.6	07.6	07.7	07.7
44	06.7	06.7	06.8	06.8	06.9	06.9	07.0	07.1	07.1	07.2
43	06.1	06.2	06.2	06.3	06.3	06.4	06.4	06.5	06.6	06.6
42	05.6	05.6	05.7	05.7	05.8	05.8	05.9	05.9	06.0	06.1
41	05.0	05.1	05.1	05.2	05.2	05.3	05.3	05.4	05.4	05.5
40	04.4	04.5	04.6	04.6	04.7	04.7	04.8	04.8	04.9	04.9
39	03.9	03.9	04.0	04.1	04.1	04.2	04.2	04.3	04.3	04.4
38	03.3	03.4	03.4	03.5	03.6	03.6	03.7	03.7	03.8	03.8
37	02.8	02.8	02.9	02.9	03.0	03.1	03.1	03.2	03.2	03.3
36	02.2	02.3	02.3	02.4	02.4	02.5	02.6	02.6	02.7	02.7
35	01.7	01.7	01.8	01.8	01.9	01.9	02.0	02.1	02.1	02.2
34	01.1	01.2	01.2	01.3	01.3	01.4	01.4	01.5	01.6	01.6
33	00.6	00.6	00.7	00.7	00.8	00.8	00.9	00.9	01.0	01.1
32	00.0	00.1	00.1	00.2	00.2	00.3	00.3	00.4	00.4	00.5
31	-00.6	-00.5	-00.4	-00.4	-00.3	-00.3	-00.2	-00.2	-00.1	-00.1
30	-01.1	-01.1	-01.0	-00.9	-00.9	-00.8	-00.8	-00.7	-00.7	-00.6
29	-01.7	-01.6	-01.6	-01.5	-01.4	-01.4	-01.3	-01.3	-01.2	-01.2
28	-02.2	-02.2	-02.1	-02.1	-02.0	-01.9	-01.9	-01.8	-01.8	-01.7
27	-02.8	-02.7	-02.7	-02.6	-02.6	-02.5	-02.4	-02.4	-02.3	-02.3
26	-03.3	-03.3	-03.2	-03.2	-03.1	-03.1	-03.0	-02.9	-02.9	-02.8
25	-03.9	-03.8	-03.8	-03.7	-03.7	-03.6	-03.6	-03.5	-03.4	-03.4
24	-04.4	-04.4	-04.3	-04.3	-04.2	-04.2	-04.1	-04.1	-04.0	-03.9
23	-05.0	-04.9	-04.9	-04.8	-04.8	-04.7	-04.7	-04.6	-04.6	-04.5

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
22	-05.6	-05.5	-05.4	-05.4	-05.3	-05.3	-05.2	-05.2	-05.1	-05.1
21	-06.1	-06.1	-06.0	-05.9	-05.9	-05.9	-05.8	-05.7	-05.7	-05.6
20	-06.7	-06.6	-06.6	-06.5	-06.4	-06.4	-06.3	-06.3	-06.2	-06.2
19	-07.2	-08.2	-07.1	-07.1	-07.0	-06.9	-06.9	-06.8	-06.8	-06.7
18	-07.8	-07.7	-07.7	-07.6	-07.6	-07.5	-07.4	-07.4	-07.3	-07.3
17	-08.3	-08.3	-08.2	-08.2	-08.1	-08.1	-08.0	-07.9	-07.9	-07.8
16	-08.9	-08.8	-08.8	-08.7	-08.7	-08.6	-08.6	-08.5	-08.4	-08.4
15	-09.4	-09.4	-09.3	-09.3	-09.2	-09.2	-09.1	-09.1	-09.0	-08.9
14	-10.0	-09.9	-09.9	-09.8	-09.8	-09.7	-09.7	-09.6	-09.6	-09.5
13	-10.6	-10.5	-10.4	-10.4	-10.3	-10.3	-10.2	-10.2	-10.1	-10.1
12	-11.1	-11.1	-11.0	-10.9	-10.9	-10.8	-10.8	-10.7	-10.7	-10.6
11	-11.7	-11.6	-11.6	-11.5	-11.4	-11.4	-11.3	-11.3	-11.2	-11.2
10	-12.2	-12.2	-12.1	-12.1	-12.0	-11.9	-11.9	-11.8	-11.8	-11.7
9	-12.8	-12.7	-12.7	-12.6	-12.6	-12.5	-12.4	-12.4	-12.3	-12.3
8	-13.3	-13.3	-13.2	-13.2	-13.1	-13.1	-13.0	-12.9	-12.9	-12.8
7	-13.9	-13.8	-13.8	-13.7	-13.7	-13.6	-13.6	-13.5	-13.4	-13.4
6	-14.4	-14.4	-14.3	-14.3	-14.2	-14.2	-14.1	-14.1	-14.0	-13.9
5	-15.0	-14.9	-14.9	-14.8	-14.8	-14.7	-14.7	-14.6	-14.6	-14.5
4	-15.6	-15.5	-15.4	-15.4	-15.3	-15.3	-15.2	-15.2	-15.1	-15.1
3	-16.1	-16.1	-16.0	-15.9	-15.9	-15.8	-15.8	-15.7	-15.7	-15.6
2	-16.7	-16.6	-16.6	-16.5	-16.4	-16.4	-16.3	-16.3	-16.2	-16.2
1	-17.2	-17.2	-17.1	-17.1	-17.0	-16.9	-16.9	-16.8	-16.8	-16.7
0	-17.8	-17.7	-17.7	-17.6	-17.6	-17.5	-17.4	-17.4	-17.3	-17.3
-0	-17.8	-17.8	-17.9	-17.9	-18.0	-18.1	-18.1	-18.2	-18.2	-18.3
-1	-18.3	-18.4	-18.4	-18.5	-18.6	-18.6	-18.7	-18.7	-18.8	-18.8
-2	-18.9	-18.9	-19.0	-19.1	-19.1	-19.2	-19.2	-19.3	-19.3	-19.4
-3	-19.4	-19.5	-19.6	-19.6	-19.7	-19.7	-19.8	-19.8	-19.9	-19.9

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
-4	-20.0	-20.1	-20.1	-20.2	-20.2	-20.3	-20.3	-20.4	-20.4	-20.5
-5	-20.6	-20.6	-20.7	-20.7	-20.3	-20.8	-20.9	-20.9	-21.0	-21.1
-6	-21.1	-21.2	-21.2	-21.3	-21.3	-21.4	-21.4	-21.5	-21.6	-21.6
-7	-21.7	-21.7	-21.8	-21.8	-21.9	-21.9	-22.0	-22.1	-22.1	-22.2
-8	-22.2	-22.3	-22.3	-22.4	-22.4	-22.5	-22.6	-22.6	-22.7	-22.7
-9	-22.8	-22.8	-22.9	-22.9	-23.0	-23.1	-23.1	-23.2	-23.2	-23.3
-10	-23.3	-23.4	-23.4	-23.5	-23.6	-23.6	-23.7	-23.7	-23.8	-23.8
-11	-23.9	-23.9	-24.0	-24.1	-24.1	-24.2	-24.2	-24.3	-24.3	-24.4
-12	-24.4	-24.5	-24.6	-24.6	-24.7	-24.7	-24.8	-24.8	-24.9	-24.9
-13	-25.0	-25.1	-25.1	-25.2	-25.2	-25.3	-25.3	-25.4	-25.4	-25.5
-14	-25.6	-25.6	-25.7	-25.7	-25.8	-25.8	-25.9	-26.9	-26.0	-26.1
-15	-26.1	-26.2	-26.2	-26.3	-26.3	-26.4	-26.4	-26.5	-26.6	-26.6
-16	-26.7	-26.7	-26.8	-26.8	-26.9	-26.9	-27.0	-27.1	-27.1	-27.2
-17	-27.2	-27.3	-27.3	-27.4	-27.4	-27.5	-27.6	-27.6	-27.7	-27.7
-18	-27.8	-27.8	-27.9	-28.9	-28.0	-28.1	-28.1	-28.2	-28.2	-28.3
-19	-28.3	-28.4	-28.4	-28.5	-28.6	-28.6	-28.7	-28.7	-28.8	-28.8
-20	-28.9	-28.9	-29.0	-29.1	-29.1	-29.2	-29.2	-29.3	-29.3	-29.4
-21	-29.4	-29.5	-29.6	-29.6	-29.7	-29.7	-29.8	-29.8	-29.9	-29.9
-22	-30.0	-30.1	-30.1	-30.2	-30.2	-30.3	-30.3	-30.4	-30.4	-30.5
-23	-30.6	-30.6	-30.7	-30.7	-30.8	-30.8	-30.9	-30.9	-31.0	-31.1
-24	-31.1	-31.2	-31.2	-31.3	-31.3	-31.4	-31.4	-31.6	-31.6	-31.6
-25	-31.7	-31.7	-31.8	-31.8	-31.9	-31.9	-32.0	-32.1	-32.1	-32.2
-26	-32.2	-32.3	-32.3	-32.4	-32.4	-32.5	-32.6	-32.6	-32.7	-32.7
-27	-32.8	-32.8	-32.9	-32.9	-33.0	-33.1	-33.1	-33.2	-33.2	-33.3
-28	-33.3	-33.4	-33.4	-33.5	-33.6	-33.6	-33.7	-33.7	-33.8	-33.8
-29	-33.9	-33.9	-34.0	-34.1	-34.1	-34.2	-34.2	-34.3	-34.3	-34.4
-30	-34.4	-34.5	-34.6	-34.6	-34.7	-34.7	-34.8	-34.8	-34.9	-34.9

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
-31	-35.0	-35.1	-35.1	-35.2	-35.2	-35.3	-35.3	-35.4	-35.4	-35.5
-32	-35.6	-35.6	-35.7	-35.7	-35.8	-35.8	-35.9	-35.9	-36.0	-36.1
-33	-36.1	-36.2	-36.2	-36.3	-36.3	-36.4	-36.4	-36.5	-36.6	-36.6
-34	-36.7	-36.7	-36.8	-36.8	-36.9	-36.9	-37.0	-37.1	-37.1	-37.2
-35	-37.2	-37.3	-37.3	-37.4	-37.4	-37.5	-37.6	-37.6	-37.7	-37.7
-36	-37.8	-37.8	-37.9	-37.9	-38.0	-38.1	-38.1	-38.2	-38.2	-38.3
-37	-38.3	-38.4	-38.4	-38.4	-38.5	-38.6	-38.6	-38.7	-38.7	-38.8
-38	-38.9	-38.9	-39.0	-39.1	-39.1	-39.2	-39.2	-39.3	-39.3	-39.4
-39	-39.4	-39.5	-39.6	-39.6	-39.7	-39.7	-39.8	-39.8	-39.9	-39.9
-40	-40.0	-40.1	-40.1	-40.2	-40.2	-40.3	-40.3	-40.4	-40.4	-40.5
-41	-40.6	-40.6	-40.7	-40.7	-40.8	-40.8	-40.9	-40.9	-41.0	-41.1
-42	-41.1	-41.2	-41.2	-41.3	-41.3	-41.4	-41.4	-41.5	-41.6	-41.6
-43	-41.7	-41.7	-41.8	-41.8	-41.9	-41.9	-42.0	-42.1	-42.1	-42.2
-44	-42.2	-42.3	-42.3	-42.4	-42.4	-42.6	-42.6	-42.6	-42.7	-42.7
-45	-42.8	-42.8	-42.9	-42.9	-43.0	-43.1	-43.1	-43.2	-43.2	-43.3
-46	-43.3	-43.4	-43.4	-43.5	-43.6	-43.6	-43.7	-43.7	-43.8	-43.8
-47	-43.9	-43.9	-44.0	-44.1	-44.1	-44.2	-44.2	-44.3	-44.3	-44.4
-48	-44.4	-44.5	-44.6	-44.6	-44.7	-44.7	-44.8	-44.8	-44.9	-44.9
-49	-45.0	-45.1	-45.1	-45.2	-45.2	-45.3	-45.3	-45.4	-45.4	-45.5
-50	-45.6	-45.6	-45.7	-45.7	-45.8	-45.8	-45.9	-45.9	-46.0	-46.1
-51	-46.1	-46.2	-46.2	-46.3	-46.3	-46.4	-46.4	-46.5	-46.5	-46.6
-52	-46.7	-46.7	-46.8	-46.8	-46.9	-46.9	-47.0	-47.1	-47.1	-47.2
-55	-47.2	-47.3	-47.3	-47.4	-47.4	-47.5	-47.6	-47.6	-47.7	-47.7
-54	-47.8	-47.8	-47.9	-47.9	-48.0	-48.1	-48.1	-48.2	-48.2	-48.3
-55	-48.3	-48.4	-48.4	-48.5	-48.6	-48.6	-48.7	-48.7	-48.8	-48.8
-56	-48.9	-48.9	-49.0	-49.1	-49.1	-49.2	-49.2	-49.3	-49.3	-49.4
-57	-49.4	-49.5	-49.6	-49.6	-49.7	-49.7	-49.8	-49.8	-49.9	-49.9

TABLE 21 (Cont'd)

Temperature

Conversion from Fahrenheit to Centigrade

°F	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
-58	-50.0	-50.1	-50.1	-50.2	-50.2	-50.3	-50.3	-50.4	-50.4	-50.5
-59	-50.6	-50.6	-50.7	-50.7	-50.8	-50.8	-50.9	-50.9	-51.0	-51.1
-60	-51.1	-51.2	-51.2	-51.3	-51.3	-51.4	-51.4	-51.5	-51.6	-51.6
-61	-51.7	-51.7	-51.8	-51.8	-51.9	-51.9	-52.0	-52.1	-52.1	-52.2
-62	-52.2	-52.3	-52.3	-52.4	-52.4	-52.5	-52.6	-52.6	-52.7	-52.7
-63	-52.8	-52.8	-52.9	-52.9	-53.0	-53.1	-53.1	-53.2	-53.2	-53.3
-64	-53.3	-53.4	-53.4	-53.5	-53.6	-53.6	-53.7	-53.7	-53.8	-53.8
-65	-53.9	-53.9	-54.0	-54.1	-54.1	-54.2	-54.2	-54.3	-54.3	-54.4
-66	-54.4	-54.6	-54.6	-54.6	-54.7	-54.7	-54.8	-54.8	-54.9	-54.9
-67	-55.0	-55.1	-55.1	-55.2	-55.2	-55.3	-55.3	-55.4	-55.4	-55.5
-68	-55.6	-55.6	-55.7	-55.7	-55.8	-55.8	-55.9	-55.9	-56.0	-56.1
-69	-56.1	-56.2	-56.2	-56.3	-56.3	-56.4	-56.4	-56.5	-56.6	-56.6
-70	-56.7	-56.7	-56.8	-56.8	-56.9	-56.9	-57.0	-57.1	-57.1	-57.2

TABLE 22

Present Weather

WMO Code 4501 for recording present weather

**Code
figure**

0   Clear (no cloud at any level)

1   Partly cloudy (scattered or broken)

2   Continuous layer(s) of cloud(s)

3   Sandstorm, duststorm, or blowing snow

4   Fog, thick dust or haze

5   Drizzle

6   Rain

7   Snow, or rain and snow mixed

8   Shower(s)

9   Thunderstorm(s)

TABLE 23

Present Weather

Conversion from Beaufort weather notation to WMO Code 4501

Abbreviation	Description	Code
b.	Blue sky whether with clear or hazy atmosphere, or sky not more than one-quarter clouded.	0
bc.	Sky between one-quarter and three-quarters clouded.	1
c.	Mainly cloudy (not less than three-quarters covered.)	1
d.	Drizzle or fine rain.	5
e.	Wet air without rain falling.	4
f.	Fog.	4
fe.	Wet fog.	4
g.	Gloomy.	2
h.	Hail.	9
kq.	Line squall.	9
l.	Lightning	9
m.	Mist.	4
o.	Overcast sky (i.e., the whole sky covered with unbroken cloud).	2
p.	Passing showers.	8
q.	Squalls.	9
r.	Rain.	6
rs.	Sleet (i.e., rain and snow together).	7
s.	Snow.	7
t.	Thunder.	9
tl.	Thunderstorm.	9
u.	Ugly, threatening sky.	2
v.	Unusual visibility.	0
z.	Dust haze; the turbid atmosphere of dry weather.	4

TABLE 24

Present Weather

Conversion from 1936 International Meteorological Organization Code to the

WMO Code 4501

	<u>Code Underlined</u>	WMO
	ABBREVIATED DESCRIPTION OF SKY AND SPECIAL PHENOMENA	Code 4501 (modified)
00	Cloudless	0
01	Partly cloudy.	1
02	Cloudy.	1
03	Overcast.	2
04	Low fog, on ground or over sea.	4
05	Haze (but visibility greater than 2,000 m., 2,200 yds).	4
06	Dust devils seen.	4
07	Distant lightning.	9
08	Light fog or mist (visibility between 1,000 and 2,000 m., 1,100 and 2,200 yds).	4
09	Fog at a distance, but not at the ship.	4
10	Precipitation within sight.	6
11	Thunder, without precipitation at the ship.	9
12	Dust storm within sight, but not at the ship.	3
13	Ugly, threatening sky.	9
14	Squally weather.	9
15	Heavy squalls. } in last 3 hours	9
16	Waterspouts seen. }	9

PRECIPITATION IN LAST HOUR BUT NOT AT TIME OF OBSERVATION

20	Precipitation (rain, drizzle, hail, snow, or sleet)		-
21	Drizzle		5
22	Rain		6
23	Snow	} other than showers	7
24	Rain and snow or sleet		7
25	Rain shower (s).	in last hour but not at	8
26	Snow shower (s).	time of observation.	7
27	Hail or rain and hail shower (s).		9
28	Slight thunderstorm.		9
29	Heavy thunderstorm.		9

TABLE 24 (Cont'd)

Conversion from 1936 International Meteorological Organization Code to the

WMO Code 4501

DUST STORMS AND STORMS OF DRIFTING SNOW	WMO Code 4501 (modified)
(Visibility less than 1,000 m., 1,100 yards)	

30	Dust or sand storm.		3
31	Dust or sand storm, has decreased.		3
32	Dust or sand storm, no appreciable change.		3
33	Dust or sand storm, has increased.		3
34	Line of dust storms.		-
35	Storm of drifting snow.		3
36	Slight storm of drifting snow }	generally low.	3
37	Heavy storm of drifting snow }		3
38	Slight storm of drifting snow }	generally high.	3
39	Heavy storm of drifting snow }		3

FOG

(Visibility less than 1,000 m., 1,100 yards)

40	Fog.		4
41	Moderate fog in last hour }	but not at time of observation.	4
42	Thick fog in last hour		4
43	Fog, sky discernible }	has become thinner during last hour.	4
44	Fog, sky not discernible		4
45	Fog, sky discernible }	no appreciable change during last hour	4
46	Fog, sky not discernible		4
47	Fog, sky discernible }	has begun or become thicker during last hour	4
48	Fog, sky not discernible		4
49	Fog in patches.		4

DRIZZLE

(Precipitation consisting of numerous minute drops)

50	Drizzle		5
51	Intermittent }	slight drizzle.	5
52	Continuous		5
53	Intermittent }	moderate drizzle.	5
54	Continuous		5
55	Intermittent }	thick drizzle.	5
56	Continuous		5
57	Drizzle and fog.		-
58	Slight or moderate }	drizzle and rain.	5
59	Thick		5

TABLE 24 (Cont'd)

Conversion from 1936 International Meteorological Organization Code to the

WMO Code 4501

RAIN

60	Rain.	6
61	Intermittent } slight rain.	6
62	Continuous }	6
63	Intermittent } moderate rain.	6
64	Continuous }	6
65	Intermittent } heavy rain.	6
66	Continuous }	6
67	Rain and fog.	-
68	Slight or moderate } rain and snow, mixed.	7
69	Heavy }	7

SNOW

70	Snow or sleet	7
71	Intermittent } slight snow in flakes	7
72	Continuous }	7
73	Intermittent } moderate snow in flakes	7
74	Continuous }	7
75	Intermittent } heavy snow in flakes	7
76	Continuous }	7
77	Snow and fog.	-
78	Granular snow (frozen drizzle).	7
79	Ice crystals;	7

SHOWERS (S)

80	Shower (s)	8
81	Shower (s) of slight or moderate } rain	8
82	Shower (s) of heavy }	8
83	Shower (s) of slight or moderate } snow	7
84	Shower (s) of heavy }	7
85	Shower (s) of slight or moderate } rain and snow.	7
86	Shower (s) of heavy }	7
87	Shower (s) of granular snow	7
88	Shower (s) of slight or moderate } hail, or rain and hail.	7
89	Shower (s) of heavy }	7

TABLE 24 (Cont'd)

Conversion from 1936 International Meteorological Organization Code   to the

WMO Code 4501

	THUNDERSTORM	WMO Code 4501 (modified)
90	Thunderstorm	9
91	Rain at time } thunderstorm during last hour, but not at	9
92	Snow, or sleet at time } time of observation.	9
93	Thunderstorm, slight without hail or soft hail, but with rain (or snow)	9
94	Thunderstorm slight with soft hail	9
95	Thunderstorm moderate without hail, but with rain (or snow)	9
96	Thunderstorm moderate with soft hail	9
97	Thunderstorm heavy without hail, but with rain (or snow)	9
98	Thunderstorm combined with dust storm	9
99	Thunderstorm heavy with hail	9

at time of observation. (applies to 94–99)

TABLE 25

Present Weather

WMO Code 4677 for recording present weather

Code figure

ww

No meteors except photometeors	00 Cloud development not observed or not observable
	01 Clouds generally dissolving or becoming less developed
	02 State of sky on the whole unchanged
	03 Clouds generally forming or developing

characteristic change of the state of sky during the past hour

Haze, dust, sand or smoke

04 Visibility reduced by smoke, e. g. veldt or forest fires, industrial smoke or volcanic ashes

05 Haze

06 Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation

07 Dust or sand raised by wind at or near the station at the time of observation, but no well developed dust whirl(s) or sand whirl(s), and no duststorm or sandstorm seen

08 Well developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm

09 Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour

10 Mist

11 Patches of

12 More or less continuous

shallow fog or ice fog at the station, whether on land or sea, not deeper than about 2 metres on land or 10 metres at sea

13 Lightning visible, no thunder heard

14 Precipitation within sight, not reaching the ground or the surface of the sea

15 Precipitation within sight, reaching the ground or the surface of the sea, but distant (i. e. estimated to be more than 5 km) from the station

16 Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station

17 Thunderstorm, but no precipitation at the time of observation

18 Squalls

19 Funnel cloud(s) **

at or within sight of the station during the preceding hour or at the time of observation

---

* The expression ''at the station'' refers to a land station or a ship.

** Tornado cloud or waterspout.

TABLE 25 (Cont'd)

ww = 20 – 29 Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation

Code figure
ww

20	Drizzle (not freezing) or snow grains	
21	Rain (not freezing)	
22	Snow	not falling as shower(s)
23	Rain and snow or ice pellets, type (a)	
24	Freezing drizzle or freezing rain	
25	Shower(s) of rain	
26	Shower(s) of snow, or of rain and snow	
27	Shower(s) of hail*, or of rain and hail*	
28	Fog or ice fog	
29	Thunderstorm (with or without precipitation)	

ww = 30 – 39 Duststorm, sandstorm, drifting or blowing snow

ww

30	Slight or moderate duststorm or sandstorm	– has decreased during the preceding hour
31		– no appreciable change during the preceding hour
32		– has begun or has increased during the preceding hour
33	Severe duststorm or sandstorm	– has decreased during the preceding hour
34		– no appreciable change during the preceding hour
35		– has begun or has increased during the preceding hour
36	Slight or moderate blowing snow	generally low (below eye level)
37	Heavy drifting snow	
38	Slight or moderate blowing snow	generally high (above eye level)
39	Heavy blowing snow	

ww = 40 – 49 Fog or ice fog at the time of observation

ww

40	Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer	
41	Fog or ice fog in patches	
42	Fog or ice fog, sky visible	has become thinner during the preceding hour
43	Fog or ice fog, sky invisible	

* Hail, ice pellets, type (b), snow pellets. French: grêle, grésil ou neige roulée.

TABLE 25 (Cont'd)

Code figure

44 Fog or ice fog, sky visible | no appreciable change during the preced-
45 Fog or ice fog, sky invisible ∫ ing hour

46 Fog or ice fog, sky visible | has begun or has become thicker during
47 Fog or ice fog, sky invisible ∫ the preceding hour

48 Fog, depositing rime, sky visible
49 Fog, depositing rime, sky invisible

---

ww = 50 – 99 *Precipitation at the station at the time of observation*

---

ww = 50 – 59 Drizzle

---

ww

50 Drizzle, not freezing, intermittent |
51 Drizzle, not freezing, continuous ∫ slight at time of observation

52 Drizzle, not freezing, intermittent |
53 Drizzle, not freezing, continuous ∫ moderate at time of observation

54 Drizzle, not freezing, intermittent |
55 Drizzle, not freezing, continuous ∫ heavy (dense) at time of observation

56 Drizzle, freezing, slight
57 Drizzle, freezing, moderate or heavy (dense)
58 Drizzle and rain, slight
59 Drizzle and rain, moderate or heavy

---

ww = 60 – 69 Rain

---

ww

60 Rain, not freezing, intermittent |
61 Rain, not freezing, continuous ∫ slight at time of observation

62 Rain, not freezing, intermittent |
63 Rain, not freezing, continuous ∫ moderate at time of observation

64 Rain, not freezing, intermittent |
65 Rain, not freezing, continuous ∫ heavy at time of observation

66 Rain, freezing, slight
67 Rain, freezing, moderate or heavy
68 Rain or drizzle and snow, slight
69 Rain or drizzle and snow, moderate or heavy

---

ww = 70 – 79 Solid precipitation not in showers

---

ww

70 Intermittent fall of snow flakes |
71 Continuous fall of snow flakes ∫ slight at time of observation

72 Intermittent fall of snow flakes |
73 Continuous fall of snow flakes ∫ moderate at time of observation

TABLE 25 (Cont'd)

Code figure

74 Intermittent fall of snow flakes ⎫ heavy at time of observation
75 Continuous fall of snow flakes ⎭
76 Ice prisms (with or without fog)
77 Snow grains (with or without fog)
78 Isolated starlike snow crystals (with or without fog)
79 Ice pellets, type (a)

---

ww = 80 – 99   Showery precipitation, or precipitation with current or recent thunder-storm

---

ww

80 Rain shower(s), slight
81 Rain shower(s), moderate or heavy
82 Rain shower(s), violent
83 Shower(s) of rain and snow mixed, slight
84 Shower(s) of rain and snow mixed, moderate or heavy
85 Snow shower(s), slight
86 Snow shower(s), moderate or heavy
87 ⎫ Shower(s) of snow pellets or ice ⎫ – slight
   ⎱ pellets, type (b), with or without ⎬
88 ⎭ rain or rain and snow mixed ⎭ – moderate or heavy
89 ⎫ Shower(s) of hail*, with or ⎫ – slight
   ⎱ without rain or rain and snow ⎬
90 ⎭ mixed, not associated with ⎭ – moderate or heavy
       thunder
91 Slight rain at time of observation ⎫
92 Moderate or heavy rain at time of ⎪
   observation   ⎪
93 Slight snow, or rain and snow mixed ⎬ thunderstorm during the pre-ceding hour but not at time of observation
   or hail** at time of observation   ⎪
94 Moderate or heavy snow, or rain and ⎪
   snow mixed or hail** at time of   ⎪
   observation   ⎭
95 Thunderstorm, slight or moderate, ⎫
   without hail**, but with rain and/or ⎪
   snow at time of observation   ⎪
96 Thunderstorm, slight or moderate, ⎪
   with hail** at time of observation ⎪
97 Thunderstorm, heavy, without hail**, ⎬ thunderstorm at time of observation
   but with rain and/or snow at time of ⎪
   observation   ⎪
98 Thunderstorm combined with dust-   ⎪
   storm or sandstorm at time of obser- ⎪
   vation   ⎪
99 Thunderstorm, heavy, with hail**   ⎪
   at time of observation   ⎭

---

* French: grêle.
** Hail, ice pellets, type (b), snow pellets. French: grêle, grésil ou neige roulée.

TABLE 26

Cloud Type (Genus)

WMO Code 0500 for recording cloud type (genus)

Code

0	Cirrus	Ci
1	Cirrocumulus	Cc
2	Cirrostratus	Cs
3	Altocumulus	Ac
4	Altostratus	As
5	Nimbostratus	Ns
6	Stratocumulus	Sc
7	Stratus	St
8	Cumulus.	Cu
9	Cumulonimbus.	Cb
x	Cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena	

TABLE 27

Cloud Amount

WMO Code 2700 for recording cloud amount

Code

0	0	0
1	1 okta or less, but not zero	$^1/_{10}$ or less, but not zero
2	2 oktas	$^2/_{10} - {}^3/_{10}$
3	3 oktas	$^4/_{10}$
4	4 oktas	$^5/_{10}$
5	5 oktas	$^6/_{10}$
6	6 oktas	$^7/_{10} - {}^8/_{10}$
7	7 oktas or more, but not 8 oktas	$^9/_{10}$ or more, but not $^{10}/_{10}$
8	8 oktas	$^{10}/_{10}$
9	Sky obscured, or cloud amount cannot be estimated	

TABLE 28

Visibility

WMO Code 4300 for recording visibility at surface

Code

0	Less than 50 metres	(less than 55 yards)
1	50–200 metres	(approx. 55–220 yards)
2	200–500 metres	(approx. 220–550 yards)
3	500–1,000 metres	(approx. 550 yards–5/8 n.m.)
4	1– 2 km	(approx. 5/8–1 n.m.)
5	2– 4 km	(approx. 1– 2 n.m.)
6	4–10 km	(approx. 2– 6 n.m.)
7	10–20 km	(approx. 6–12 n.m.)
8	20–50 km	(approx. 12–30 n.m.)
9	50 km or more	(30 n.m. or more)

TABLE 29

Precision of Measurement

This table is to be added later.

TABLE 30

Salinity

Conversion from chlorinity to salinity $\%_{oo}$

Cl	S	Cl	S	Cl	S	Cl	S
0.01	0.05	0.40	0.75	0.80	1.47	1.20	2.20
.02	.07	.41	.77	.81	.49	.21	.21
.03	.08	.42	.79	.82	.51	.22	.23
.04	.10	.43	.81	.83	.53	.23	.25
.05	.12	.44	.82	.84	.55	.24	.27
.06	.14	.45	.84	.85	.56	.25	.29
.07	.16	.46	.86	.86	.58	.26	.30
.08	.17	.47	.88	.87	.60	.27	.32
.09	.19	.48	.90	.88	.62	.28	.34
		.49	.91	.89	.64	.29	.36
0.10	0.21						
.11	.23	0.50	0.93	0.90	1.65	1.30	2.38
.12	.25	.51	.95	.91	.67	.31	.39
.13	.26	.52	.97	.92	.69	.32	.41
.14	.28	.53	.99	.93	.71	.33	.43
.15	.30	.54	1.00	.94	.73	.34	.45
.16	.32	.55	1.02	.95	.74	.35	.47
.17	.34	.56	1.04	.96	.76	.36	.48
.18	.35	.57	1.06	.97	.78	.37	.50
.19	.37	.58	1.08	.98	.80	.38	.52
		.59	1.09	.99	.82	.39	.54
0.20	0.39						
.21	.41	0.60	1.11	1.00	1.84		
.22	.43	.61	1.13	.01	.85		
.23	.45	.62	1.15	.02	.87		
.24	.46	.63	1.17	.03	.89		
.25	.48	.64	1.19	.04	.91		
.26	.50	.65	1.20	.05	.93		
.27	.52	.66	1.22	.06	.94		
.28	.54	.67	1.24	.07	.96		
.29	.55	.68	1.26	.08	.98		
		.69	1.28	.09	2.00		
0.30	0.57						
.31	.59	0.70	1.29	1.10	2.02		
.32	.61	.71	1.31	.11	.03		
.33	.63	.72	1.33	.12	.05		
.34	.64	.73	1.35	.13	.07		
.35	.66	.74	1.37	.14	.09		
.36	.68	.75	1.38	.15	.11		
.37	.70	.76	1.40	.16	.12		
.38	.72	.77	1.42	.17	.14		
.39	.73	.78	1.44	.18	.16		
		.79	1.46	.19	.18		

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (°/oo)

Cl	S	Cl	S	Cl	S	Cl	S
1.40	2.56	1.80	3.28	2.20	4.00	2.60	4.72
.41	.58	.81	.30	.21	.02	.61	.74
.42	.59	.82	.32	.22	.04	.62	.76
.43	.61	.83	.33	.23	.06	.63	.78
.44	.63	.84	.35	.24	.07	.64	.80
.45	.65	.85	.37	.25	.09	.65	.81
.46	.67	.86	.39	.26	.11	.66	.83
.47	.68	.87	.41	.27	.13	.67	.85
.48	.70	.88	.42	.28	.15	.68	.87
.49	.72	.89	.44	.29	.16	.69	.89
1.50	2.74	1.90	3.46	2.30	4.18	2.70	4.90
.51	.76	.91	.48	.31	.20	.71	.92
.52	.77	.92	.50	.32	.22	.72	.94
.53	.79	.93	.51	.33	.24	.73	.96
.54	.81	.94	.53	.34	.25	.74	.98
.55	.83	.95	.55	.35	.27	.75	.99
.56	.85	.96	.57	.36	.29	.76	5.01
.57	.86	.97	.59	.37	.31	.77	.03
.58	.88	.98	.60	.38	.33	.78	.05
.59	.90	.99	.62	.39	.34	.79	.07
1.60	2.92	2.00	3.64	2.40	4.36	2.80	5.08
.61	.94	.01	.66	.41	.38	.81	.10
.62	.95	.02	.68	.42	.40	.82	.12
.63	.97	.03	.69	.43	.42	.83	.14
.64	.99	.04	.71	.44	.43	.84	.16
.65	3.01	.05	.73	.45	.45	.85	.17
.66	.03	.06	.75	.46	.47	.86	.19
.67	.04	.07	.77	.47	.49	.87	.21
.68	.06	.08	.78	.48	.51	.88	.23
.69	.08	.09	.80	.49	.52	.89	.25
1.70	3.10	2.10	3.82	2.50	4.54	2.90	5.26
.71	.12	.11	.84	.51	.56	.91	.28
.72	.13	.12	.86	.52	.58	.92	.30
.73	.15	.13	.87	.53	.60	.93	.32
.74	.17	.14	.89	.54	.61	.94	.34
.75	.19	.15	.91	.55	.63	.95	.35
.76	.21	.16	.93	.56	.65	.96	.37
.77	.22	.17	.95	.57	.67	.97	.39
.78	.24	.18	.96	.58	.69	.98	.41
.79	.26	.19	.98	.59	.70	.99	.43

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
3.00	5.45	3.40	6.17	3.80	6.89	4.20	7.61
.01	.46	.41	.19	.81	.91	.21	.63
.02	.48	.42	.20	.82	.93	.22	.65
.03	.50	.43	.22	.83	.94	.23	.67
.04	.52	.44	.24	.84	.96	.24	.68
.05	.54	.45	.26	.85	.98	.25	.70
.06	.55	.46	.28	.86	7.00	.26	.72
.07	.57	.47	.29	.87	.02	.27	.74
.08	.59	.48	.31	.88	.03	.28	.76
.09	.61	.49	.33	.89	.05	.29	.77
3.10	5.63	3.50	6.35	3.90	7.07	4.30	7.79
.11	.64	.51	.37	.91	.09	.31	.81
.12	.66	.52	.38	.92	.11	.32	.83
.13	.68	.53	.40	.93	.12	.33	.85
.14	.70	.54	.42	.94	.14	.34	.86
.15	.72	.55	.44	.95	.16	.35	.88
.16	.73	.56	.46	.96	.18	.36	.90
.17	.75	.57	.47	.97	.20	.37	.92
.18	.77	.58	.49	.98	.21	.38	.94
.19	.79	.59	.51	.99	.23	.39	.95
3.20	5.81	3.60	6.53	4.00	7.25	4.40	7.97
.21	.82	.61	.55	.01	.27	.41	.99
.22	.84	.62	.56	.02	.29	.42	8.01
.23	.86	.63	.58	.03	.30	.43	.03
.24	.88	.64	.60	.04	.32	.44	.04
.25	.90	.65	.62	.05	.34	.45	.06
.26	.91	.66	.64	.06	.36	.46	.08
.27	.93	.67	.65	.07	.38	.47	.10
.28	.95	.68	.67	.08	.39	.48	.12
.29	.97	.69	.69	.09	.41	.49	.13
3.30	5.99	3.70	6.71	4.10	7.43	4.50	8.15
.31	6.00	.71	.73	.11	.45	.51	.17
.32	.02	.72	.74	.12	.47	.52	.19
.33	.04	.73	.76	.13	.48	.53	.21
.34	.06	.74	.78	.14	.50	.54	.22
.35	.08	.75	.80	.15	.52	.55	.24
.36	.09	.76	.82	.16	.54	.56	.26
.37	.11	.77	.83	.17	.56	.57	.28
.38	.13	.78	.85	.18	.57	.58	.30
.39	.15	.79	.87	.19	.59	.59	.31

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
4.60	8.33	5.00	9.06	5.40	9.78	5.80	10.50
.61	.35	.01	.07	.41	.80	.81	.52
.62	.37	.02	.09	.42	.81	.82	.54
.63	.39	.03	.11	.43	.83	.83	.55
.64	.41	.04	.13	.44	.85	.84	.57
.65	.42	.05	.15	.45	.87	.85	.59
.66	.44	.06	.16	.46	.89	.86	.61
.67	.46	.07	.18	.47	.90	.87	.63
.68	.48	.08	.20	.48	.92	.88	.64
.69	.50	.09	.22	.49	.94	.89	.66
4.70	8.51	5.10	9.24	5.50	9.96	5.90	10.68
.71	.53	.11	.25	.51	.98	.91	.70
.72	.55	.12	.27	.52	.99	.92	.72
.73	.57	.13	.29	.53	10.01	.93	.73
.74	.59	.14	.31	.54	.03	.94	.75
.75	.60	.15	.33	.55	.05	.95	.77
.76	.62	.16	.34	.56	.07	.96	.79
.77	.64	.17	.36	.57	.08	.97	.81
.78	.66	.18	.38	.58	.10	.98	.82
.79	.68	.19	.40	.59	.12	.99	.84
4.80	8.69	5.20	9.42	5.60	10.14	6.00	10.86
.81	.71	.21	.43	.61	.16	.01	.88
.82	.73	.22	.45	.62	.17	.02	.90
.83	.75	.23	.47	.63	.19	.03	.91
.84	.77	.24	.49	.64	.21	.04	.93
.85	.78	.25	.51	.65	.23	.05	.95
.86	.80	.26	.52	.66	.25	.06	.97
.87	.82	.27	.54	.67	.26	.07	.99
.88	.84	.28	.56	.68	.28	.08	11.00
.89	.86	.29	.58	.69	.30	.09	.02
4.90	8.87	5.30	9.60	5.70	10.32	6.10	11.04
.91	.89	.31	.61	.71	.34	.11	.06
.92	.91	.32	.63	.72	.35	.12	.08
.93	.93	.33	.65	.73	.37	.13	.09
.94	.95	.34	.67	.74	.39	.14	.11
.95	.96	.35	.69	.75	.41	.15	.13
.96	.98	.36	.70	.76	.43	.16	.15
.97	9.00	.37	.72	.77	.44	.17	.17
.98	.02	.38	.74	.78	.46	.18	.18
.99	.04	.39	.76	.79	.48	.19	.20

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (°/oo)

Cl	S	Cl	S	Cl	S	Cl	S
6.20	11.22	6.60	11.94	7.00	12.67	7.40	13.39
.21	.24	.61	.96	.01	.68	.41	.41
.22	.26	.62	.98	.02	.70	.42	.42
.23	.28	.63	12.00	.03	.72	.43	.44
.24	.29	.64	.02	.04	.74	.44	.46
.25	.31	.65	.03	.05	.76	.45	.48
.26	.33	.66	.05	.06	.77	.46	.50
.27	.35	.67	.07	.07	.79	.47	.51
.28	.37	.68	.09	.08	.81	.48	.53
.29	.38	.69	.11	.09	.83	.49	.55
6.30	11.40	6.70	12.12	7.10	12.85	7.50	13.57
.31	.42	.71	.14	.11	.86	.51	.59
.32	.44	.72	.16	.12	.88	.52	.60
.33	.46	.73	.18	.13	.90	.53	.62
.34	.47	.74	.20	.14	.92	.54	.64
.35	.49	.75	.21	.15	.94	.55	.66
.36	.51	.76	.23	.16	.95	.56	.68
.37	.53	.77	.25	.17	.97	.57	.69
.38	.55	.78	.27	.18	.99	.58	.71
.39	.56	.79	.29	.19	13.01	.59	.73
6.40	11.58	6.80	12.30	7.20	13.03	7.60	13.75
.41	.60	.81	.32	.21	.04	.61	.77
.42	.62	.82	.34	.22	.06	.62	.78
.43	.64	.83	.36	.23	.08	.63	.80
.44	.65	.84	.38	.24	.10	.64	.82
.45	.67	.85	.39	.25	.12	.65	.84
.46	.69	.86	.41	.26	.13	.66	.86
.47	.71	.87	.43	.27	.15	.67	.87
.48	.73	.88	.45	.28	.17	.68	.89
.49	.74	.89	.47	.29	.19	.69	.91
6.50	11.76	6.90	12.48	7.30	13.21	7.70	13.93
.51	.78	.91	.50	.31	.22	.71	.95
.52	.80	.92	.52	.32	.24	.72	.96
.53	.82	.93	.54	.33	.26	.73	.98
.54	.83	.94	.56	.34	.28	.74	14.00
.55	.85	.95	.57	.35	.30	.75	.02
.56	.87	.96	.59	.36	.31	.76	.04
.57	.89	.97	.61	.37	.33	.77	.05
.58	.91	.98	.63	.38	.35	.78	.07
.59	.92	.99	.65	.39	.37	.79	.09

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
7.80	14.11	8.20	14.83	8.60	15.55	9.00	16.28
.81	.13	.21	.85	.61	.57	.01	.29
.82	.15	.22	.87	.62	.59	.02	.31
.83	.16	.23	.89	.63	.61	.03	.33
.84	.18	.24	.90	.64	.63	.04	.35
.85	.20	.25	.92	.65	.64	.05	.37
.86	.22	.26	.94	.66	.66	.06	.38
.87	.24	.27	.96	.67	.68	.07	.40
.88	.25	.28	.98	.68	.70	.08	.42
.89	.27	.29	.99	.69	.72	.09	.44
7.90	14.29	8.30	15.01	8.70	15.73	9.10	16.46
.91	.31	.31	.03	.71	.75	.11	.47
.92	.33	.32	.05	.72	.77	.12	.49
.93	.34	.33	.07	.73	.79	.13	.51
.94	.36	.34	.08	.74	.81	.14	.53
.95	.38	.35	.10	.75	.82	.15	.55
.96	.40	.36	.12	.76	.84	.16	.56
.97	.42	.37	.14	.77	.86	.17	.58
.98	.43	.38	.16	.78	.88	.18	.60
.99	.45	.39	.17	.79	.90	.19	.62
8.00	14.47	8.40	15.19	8.80	15.91	9.20	16.64
.01	.49	.41	.21	.81	.93	.21	.65
.02	.51	.42	.23	.82	.95	.22	.67
.03	.52	.43	.25	.83	.97	.23	.69
.04	.54	.44	.26	.84	.99	.24	.71
.05	.56	.45	.28	.85	16.00	.25	.73
.06	.58	.46	.30	.86	.02	.26	.74
.07	.60	.47	.32	.87	.04	.27	.76
.08	.61	.48	.34	.88	.06	.28	.78
.09	.63	.49	.35	.89	.08	.29	.80
8.10	14.65	8.50	15.37	8.90	16.09	9.30	16.82
.11	.67	.51	.39	.91	.11	.31	.83
.12	.69	.52	.41	.92	.13	.32	.85
.13	.70	.53	.43	.93	.15	.33	.87
.14	.72	.54	.44	.94	.17	.34	.89
.15	.74	.55	.46	.95	.18	.35	.91
.16	.76	.56	.48	.96	.20	.36	.92
.17	.78	.57	.50	.97	.22	.37	.94
.18	.79	.58	.52	.98	.24	.38	.96
.19	.81	.59	.53	.99	.26	.39	.98

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity ($^o/oo$)

Cl	S	Cl	S	Cl	S	Cl	S
9.40	17.00	9.80	17.72	10.20	18.44	10.60	19.16
.41	.02	.81	.74	.21	.46	.61	.18
.42	.03	.82	.76	.22	.48	.62	.20
.43	.05	.83	.77	.23	.50	.63	.22
.44	.07	.84	.79	.24	.51	.64	.24
.45	.09	.85	.81	.25	.53	.65	.25
.46	.11	.86	.83	.26	.55	.66	.27
.47	.12	.87	.85	.27	.57	.67	.29
.48	.14	.88	.86	.28	.59	.68	.31
.49	.16	.89	.88	.29	.60	.69	.33
9.50	17.18	9.90	17.90	10.30	18.62	10.70	19.34
.51	.20	.91	.92	.31	.64	.71	.36
.52	.21	.92	.94	.32	.66	.72	.38
.53	.23	.93	.95	.33	.68	.73	.40
.54	.25	.94	.97	.34	.69	.74	.42
.55	.27	.95	.99	.35	.71	.75	.43
.56	.29	.96	18.01	.36	.73	.76	.45
.57	.30	.97	.03	.37	.75	.77	.47
.58	.32	.98	.04	.38	.77	.78	.49
.59	.34	.99	.06	.39	.78	.79	.51
9.60	17.36	10.00	18.08	10.40	18.80	10.80	19.52
.61	.38	.01	.10	.41	.82	.81	.54
.62	.39	.02	.12	.42	.84	.82	.56
.63	.41	.03	.13	.43	.86	.83	.58
.64	.43	.04	.15	.44	.87	.84	.60
.65	.45	.05	.17	.45	.89	.85	.61
.66	.47	.06	.19	.46	.91	.86	.63
.67	.48	.07	.21	.47	.93	.87	.65
.68	.50	.08	.22	.48	.95	.88	.67
.69	.52	.09	.24	.49	.96	.89	.69
9.70	17.54	10.10	18.26	10.50	18.98	10.90	19.70
.71	.56	.11	.28	.51	19.00	.91	.72
.72	.57	.12	.30	.52	.02	.92	.74
.73	.59	.13	.31	.53	.04	.93	.76
.74	.61	.14	.33	.54	.05	.94	.78
.75	.63	.15	.35	.55	.07	.95	.79
.76	.65	.16	.37	.56	.09	.96	.81
.77	.66	.17	.39	.57	.11	.97	.83
.78	.68	.18	.40	.58	.13	.98	.85
.79	.70	.19	.42	.59	.14	.99	.87

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
11.00	19.89	11.40	20.61	11.80	21.33	12.20	22.05
.01	.90	.41	.63	.81	.35	.21	.07
.02	.92	.42	.64	.82	.37	.22	.09
.03	.94	.43	.66	.83	.38	.23	.11
.04	.96	.44	.68	.84	.40	.24	.12
.05	.98	.45	.70	.85	.42	.25	.14
.06	.99	.46	.72	.86	.44	.26	.16
.07	20.01	.47	.73	.87	.46	.27	.18
.08	.03	.48	.75	.88	.47	.28	.20
.09	.05	.49	.77	.89	.49	.29	.21
11.10	20.07	11.50	20.79	11.90	21.51	12.30	22.23
.11	.08	.51	.81	.91	.53	.31	.25
.12	.10	.52	.82	.92	.55	.32	.27
.13	.12	.53	.84	.93	.56	.33	.29
.14	.14	.54	.86	.94	.58	.34	.30
.15	.16	.55	.88	.95	.60	.35	.32
.16	.17	.56	.90	.96	.62	.36	.34
.17	.19	.57	.91	.97	.64	.37	.36
.18	.21	.58	.93	.98	.65	.38	.38
.19	.23	.59	.95	.99	.67	.39	.39
11.20	20.25	11.60	20.97	12.00	21.69	12.40	22.41
.21	.26	.61	.99	.01	.71	.41	.43
.22	.28	.62	21.00	.02	.73	.42	.45
.23	.30	.63	.02	.03	.74	.43	.47
.24	.32	.64	.04	.04	.76	.44	.48
.25	.34	.65	.06	.05	.78	.45	.50
.26	.35	.66	.08	.06	.80	.46	.52
.27	.37	.67	.09	.07	.82	.47	.54
.28	.39	.68	.11	.08	.83	.48	.56
.29	.41	.69	.13	.09	.85	.49	.57
11.30	20.43	11.70	21.15	12.10	21.87	12.50	22.59
.31	.44	.71	.17	.11	.89	.51	.61
.32	.46	.72	.18	.12	.91	.52	.63
.33	.48	.73	.20	.13	.92	.53	.65
.34	.50	.74	.22	.14	.94	.54	.66
.35	.52	.75	.24	.15	.96	.55	.68
.36	.53	.76	.26	.16	.98	.56	.70
.37	.55	.77	.27	.17	22.00	.57	.72
.38	.57	.78	.29	.18	.01	.58	.74
.39	.59	.79	.31	.19	.03	.59	.75

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (°/oo)

Cl	S	Cl	S	Cl	S	Cl	S
12.60	22.77	13.00	23.50	13.40	24.22	13.80	24.94
.61	.79	.01	.51	.41	.24	.81	.96
.62	.81	.02	.53	.42	.25	.82	.98
.63	.83	.03	.55	.43	.27	.83	.99
.64	.85	.04	.57	.44	.29	.84	25.01
.65	.86	.05	.59	.45	.31	.85	.03
.66	.88	.06	.60	.46	.33	.86	.05
.67	.90	.07	.62	.47	.34	.87	.07
.68	.92	.08	.64	.48	.36	.88	.08
.69	.94	.09	.66	.49	.38	.89	.10
12.70	22.95	13.10	23.68	13.50	24.40	13.90	25.12
.71	.97	.11	.69	.51	.42	.91	.14
.72	.99	.12	.71	.52	.43	.92	.16
.73	23.01	.13	.73	.53	.45	.93	.17
.74	.03	.14	.75	.54	.47	.94	.19
.75	.04	.15	.77	.55	.49	.95	.21
.76	.06	.16	.78	.56	.51	.96	.23
.77	.08	.17	.80	.57	.52	.97	.25
.78	.10	.18	.82	.58	.54	.98	.26
.79	.12	.19	.84	.59	.56	.99	.28
12.80	23.13	13.20	23.86	13.60	24.58	14.00	25.30
.81	.15	.21	.87	.61	.60	.01	.32
.82	.17	.22	.89	.62	.61	.02	.34
.83	.19	.23	.91	.63	.63	.03	.35
.84	.21	.24	.93	.64	.65	.04	.37
.85	.22	.25	.95	.65	.67	.05	.39
.86	.24	.26	.96	.66	.69	.06	.41
.87	.26	.27	.98	.67	.70	.07	.43
.88	.28	.28	24.00	.68	.72	.08	.44
.89	.30	.29	.02	.69	.74	.09	.46
12.90	23.31	13.30	24.04	13.70	24.76	14.10	25.48
.91	.33	.31	.05	.71	.78	.11	.50
.92	.35	.32	.07	.72	.79	.12	.52
.93	.37	.33	.09	.73	.81	.13	.53
.94	.39	.34	.11	.74	.83	.14	.55
.95	.40	.35	.13	.75	.85	.15	.57
.96	.42	.36	.14	.76	.87	.16	.59
.97	.44	.37	.16	.77	.88	.17	.61
.98	.46	.38	.18	.78	.90	.18	.62
.99	.48	.39	.20	.79	.92	.19	.64

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
14.20	25.66	14.60	26.38	15.00	27.11	15.40	27.83
.21	.68	.61	.40	.01	.12	.41	.85
.22	.70	.62	.42	.02	.14	.42	.86
.23	.72	.63	.44	.03	.16	.43	.88
.24	.73	.64	.46	.04	.18	.44	.90
.25	.75	.65	.47	.05	.20	.45	.92
.26	.77	.66	.49	.06	.21	.46	.94
.27	.79	.67	.51	.07	.23	.47	.95
.28	.81	.68	.53	.08	.25	.48	.97
.29	.82	.69	.55	.09	.27	.49	.99
14.30	25.84	14.70	26.56	15.10	27.29	15.50	28.01
.31	.86	.71	.58	.11	.30	.51	.03
.32	.88	.72	.60	.12	.32	.52	.04
.33	.90	.73	.62	.13	.34	.53	.06
.34	.91	.74	.64	.14	.36	.54	.08
.35	.93	.75	.65	.15	.38	.55	.10
.36	.95	.76	.67	.16	.39	.56	.12
.37	.97	.77	.69	.17	.41	.57	.13
.38	.99	.78	.71	.18	.43	.58	.15
.39	26.00	.79	.73	.19	.45	.59	.17
14.40	26.02	14.80	26.74	15.20	27.47	15.60	28.19
.41	.04	.81	.76	.21	.48	.61	.21
.42	.06	.82	.78	.22	.50	.62	.22
.43	.08	.83	.80	.23	.52	.63	.24
.44	.09	.84	.82	.24	.54	.64	.26
.45	.11	.85	.83	.25	.56	.65	.28
.46	.13	.86	.85	.26	.57	.66	.30
.47	.15	.87	.87	.27	.59	.67	.31
.48	.17	.88	.89	.28	.61	.68	.33
.49	.18	.89	.91	.29	.63	.69	.35
14.50	26.20	14.90	26.92	15.30	27.65	15.70	28.37
.51	.22	.91	.94	.31	.66	.71	.39
.52	.24	.92	.96	.32	.68	.72	.40
.53	.26	.93	.98	.33	.70	.73	.42
.54	.27	.94	27.00	.34	.72	.74	.44
.55	.29	.95	.01	.35	.74	.75	.46
.56	.31	.96	.03	.36	.75	.76	.48
.57	.33	.97	.05	.37	.77	.77	.49
.58	.35	.98	.07	.38	.79	.78	.51
.59	.36	.99	.09	.39	.81	.79	.53

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (°/oo)

Cl	S	Cl	S	Cl	S	Cl	S
15.80	28.55	16.20	29.27	16.60	29.99	17.00	30.72
.81	.57	.21	.29	.61	30.01	.01	.73
.82	.59	.22	.31	.62	.03	.02	.75
.83	.60	.23	.33	.63	.05	.03	.77
.84	.62	.24	.34	.64	.07	.04	.79
.85	.64	.25	.36	.65	.08	.05	.81
.86	.66	.26	.38	.66	.10	.06	.82
.87	.68	.27	.40	.67	.12	.07	.84
.88	.69	.28	.42	.68	.14	.08	.86
.89	.71	.29	.43	.69	.16	.09	.88
15.90	28.73	16.30	29.45	16.70	30.17	17.10	30.90
.91	.75	.31	.47	.71	.19	.11	.91
.92	.77	.32	.49	.72	.21	.12	.93
.93	.78	.33	.51	.73	.23	.13	.95
.94	.80	.34	.52	.74	.25	.14	.97
.95	.82	.35	.54	.75	.26	.15	.99
.96	.84	.36	.56	.76	.28	.16	31.00
.97	.86	.37	.58	.77	.30	.17	.02
.98	.87	.38	.60	.78	.32	.18	.04
.99	.89	.39	.61	.79	.34	.19	.06
16.00	28.91	16.40	29.63	16.80	30.35	17.20	31.08
.01	.93	.41	.65	.81	.37	.21	.09
.02	.95	.42	.67	.82	.39	.22	.11
.03	.96	.43	.69	.83	.41	.23	.13
.04	.98	.44	.70	.84	.43	.24	.15
.05	29.00	.45	.72	.85	.44	.25	.17
.06	.02	.46	.74	.86	.46	.26	.18
.07	.04	.47	.76	.87	.48	.27	.20
.08	.05	.48	.78	.88	.50	.28	.22
.09	.07	.49	.79	.89	.52	.29	.24
16.10	29.09	16.50	29.81	16.90	30.53	17.30	31.26
.11	.11	.51	.83	.91	.55	.31	.27
.12	.13	.52	.85	.92	.57	.32	.29
.13	.14	.53	.87	.93	.59	.33	.31
.14	.16	.54	.88	.94	.61	.34	.33
.15	.18	.55	.90	.95	.62	.35	.35
.16	.20	.56	.92	.96	.64	.36	.36
.17	.22	.57	.94	.97	.66	.37	.38
.18	.23	.58	.96	.98	.68	.38	.40
.19	.25	.59	.97	.99	.70	.39	.42

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity ($^o/oo$)

Cl	S	Cl	S	Cl	S	Cl	S
17.40	31.44	17.80	32.16	18.20	32.88	18.60	33.60
.41	.46	.81	.18	.21	.90	.61	.62
.42	.47	.82	.20	.22	.92	.62	.64
.43	.49	.83	.21	.23	.94	.63	.66
.44	.51	.84	.23	.24	.95	.64	.68
.45	.53	.85	.25	.25	.97	.65	.69
.46	.55	.86	.27	.26	.99	.66	.71
.47	.56	.87	.29	.27	33.01	.67	.73
.48	.58	.88	.30	.28	.03	.68	.75
.49	.60	.89	.32	.29	.04	.69	.77
17.50	31.62	17.90	32.34	18.30	33.06	18.70	33.78
.51	.64	.91	.36	.31	.08	.71	.80
.52	.65	.92	.38	.32	.10	.72	.82
.53	.67	.93	.39	.33	.12	.73	.84
.54	.69	.94	.41	.34	.13	.74	.86
.55	.71	.95	.43	.35	.15	.75	.87
.56	.73	.96	.45	.36	.17	.76	.89
.57	.74	.97	.47	.37	.19	.77	.91
.58	.76	.98	.48	.38	.21	.78	.93
.59	.78	.99	.50	.39	.22	.79	.95
17.60	31.80	18.00	32.52	18.40	33.24	18.80	33.96
.61	.82	.01	.54	.41	.26	.81	.98
.62	.83	.02	.56	.42	.28	.82	34.00
.63	.85	.03	.57	.43	.30	.83	.02
.64	.87	.04	.59	.44	.31	.84	.04
.65	.89	.05	.61	.45	.33	.85	.05
.66	.91	.06	.63	.46	.35	.86	.07
.67	.92	.07	.65	.47	.37	.87	.09
.68	.94	.08	.66	.48	.39	.88	.11
.69	.96	.09	.68	.49	.40	.89	.13
17.70	31.98	18.10	32.70	18.50	33.42	18.90	34.14
.71	32.00	.11	.72	.51	.44	.91	.16
.72	.01	.12	.74	.52	.46	.92	.18
.73	.03	.13	.75	.53	.48	.93	.20
.74	.05	.14	.77	.54	.49	.94	.22
.75	.07	.15	.79	.55	.51	.95	.23
.76	.09	.16	.81	.56	.53	.96	.25
.77	.10	.17	.83	.57	.55	.97	.27
.78	.12	.18	.84	.58	.57	.98	.29
.79	.14	.19	.86	.59	.58	.99	.31

TABLE 30 (Cont'd)

Salinty

Conversion from chlorinity to salinity (°/oo)

Cl	S	Cl	S	Cl	S	Cl	S
19.00	34.33	19.40	35.05	19.80	35.77	20.20	36.49
.01	.34	.41	.07	.81	.79	.21	.51
.02	.36	.42	.08	.82	.81	.22	.53
.03	.38	.43	.10	.83	.82	.23	.55
.04	.40	.44	.12	.84	.84	.24	.56
.05	.42	.45	.14	.85	.86	.25	.58
.06	.43	.46	.16	.86	.88	.26	.60
.07	.45	.47	.17	.87	.90	.27	.62
.08	.47	.48	.19	.88	.91	.28	.64
.09	.49	.49	.21	.89	.93	.29	.65
19.10	34.51	19.50	35.23	19.90	35.95	20.30	36.67
.11	.52	.51	.25	.91	.97	.31	.69
.12	.54	.52	.26	.92	.99	.32	.71
.13	.56	.53	.28	.93	36.00	.33	.73
.14	.58	.54	.30	.94	.02	.34	.74
.15	.60	.55	.32	.95	.04	.35	.76
.16	.61	.56	.34	.96	.06	.36	.78
.17	.63	.57	.35	.97	.08	.37	.80
.18	.65	.58	.37	.98	.09	.38	.82
.19	.67	.59	.39	.99	.11	.39	.83
19.20	34.69	19.60	35.41	20.00	36.13	20.40	36.85
.21	.70	.61	.43	.01	.15	.41	.87
.22	.72	.62	.44	.02	.17	.42	.89
.23	.74	.63	.46	.03	.18	.43	.91
.24	.76	.64	.48	.04	.20	.44	.92
.25	.78	.65	.50	.05	.22	.45	.94
.26	.79	.66	.52	.06	.24	.46	.96
.27	.81	.67	.53	.07	.26	.47	.98
.28	.83	.68	.55	.08	.27	.48	37.00
.29	.85	.69	.57	.09	.29	.49	.01
19.30	34.87	19.70	35.59	20.10	36.31	20.50	37.03
.31	.88	.71	.61	.11	.33	.51	.05
.32	.90	.72	.62	.12	.35	.52	.07
.33	.92	.73	.64	.13	.36	.53	.09
.34	.94	.74	.66	.14	.38	.54	.10
.35	.96	.75	.68	.15	.40	.55	.12
.36	.97	.76	.70	.16	.42	.56	.14
.37	.99	.77	.71	.17	.44	.57	.16
.38	35.01	.78	.73	.18	.45	.58	.18
.39	.03	.79	.75	.19	.47	.59	.19

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity (^{o}/oo)

Cl	S	Cl	S	Cl	S	Cl	S
20.60	37.21	21.00	37.94	21.40	38.66	21.80	39.38
.61	.23	.01	.95	.41	.68	.81	.40
.62	.25	.02	.97	.42	.69	.82	.42
.63	.27	.03	.99	.43	.71	.83	.43
.64	.29	.04	38.01	.44	.73	.84	.45
.65	.30	.05	.03	.45	.75	.85	.47
.66	.32	.06	.04	.46	.77	.86	.49
.67	.34	.07	.06	.47	.78	.87	.51
.68	.36	.08	.08	.48	.80	.88	.52
.69	.38	.09	.10	.49	.82	.89	.54
20.70	37.39	21.10	38.12	21.50	38.84	21.90	39.56
.71	.41	.11	.13	.51	.86	.91	.58
.72	.43	.12	.15	.52	.87	.92	.60
.73	.45	.13	.17	.53	.89	.93	.61
.74	.47	.14	.19	.54	.91	.94	.63
.75	.48	.15	.21	.55	.93	.95	.65
.76	.50	.16	.22	.56	.95	.96	.67
.77	.52	.17	.24	.57	.96	.97	.69
.78	.54	.18	.26	.58	.98	.98	.70
.79	.56	.19	.28	.59	39.00	.99	.72
20.80	37.57	21.20	38.30	21.60	39.02	22.00	39.74
.81	.59	.21	.31	.61	.04	.01	.76
.82	.61	.22	.33	.62	.05	.02	.78
.83	.63	.23	.35	.63	.07	.03	.79
.84	.65	.24	.37	.64	.09	.04	.81
.85	.66	.25	.39	.65	.11	.05	.83
.86	.68	.26	.40	.66	.13	.06	.85
.87	.70	.27	.42	.67	.14	.07	.87
.88	.72	.28	.44	.68	.16	.08	.88
.89	.74	.29	.46	.69	.18	.09	.90
20.90	37.75	21.30	38.48	21.70	39.20	22.10	39.92
.91	.77	.31	.49	.71	.22	.11	.94
.92	.79	.32	.51	.72	.23	.12	.96
.93	.81	.33	.53	.73	.25	.13	.97
.94	.83	.34	.55	.74	.27	.14	.99
.95	.84	.35	.57	.75	.29	.15	40.01
.96	.86	.36	.58	.76	.31	.16	.03
.97	.88	.37	.60	.77	.32	.17	.05
.98	.90	.38	.62	.78	.34	.18	.06
.99	.92	.39	.64	.79	.36	.19	.08

TABLE 30 (Cont'd)

Salinity

Conversion from chlorinity to salinity ($^o/oo$)

Cl	S	Cl	S
22.20	40.10	22.60	40.82
.21	.12	.61	.84
.22	.14	.62	.86
.23	.16	.63	.88
.24	.17	.64	.90
.25	.19	.65	.91
.26	.21	.66	.93
.27	.23	.67	.95
.28	.25	.68	.97
.29	.26	.69	.99
22.30	40.28	22.70	41.00
.31	.30	.71	.02
.32	.32	.72	.04
.33	.34	.73	.06
.34	.35	.74	.08
.35	.37	.75	.09
.36	.39	.76	.11
.37	.41	.77	.13
.38	.43	.78	.15
.39	.44	.79	.17
22.40	40.46	22.80	41.18
.41	.48	.81	.20
.42	.50	.82	.22
.43	.52	.83	.24
.44	.53	.84	.26
.45	.55	.85	.27
.46	.57	.86	.29
.47	.59	.87	.31
.48	.61	.88	.33
.49	.62	.89	.35
22.50	40.64	22.90	41.36
.51	.66	.91	.38
.52	.68	.92	.40
.53	.70	.93	.42
.54	.71	.94	.44
.55	.73	.95	.45
.56	.75	.96	.47
.57	.77	.97	.49
.58	.79	.98	.51
.59	.80	.99	.53
		23.00	41.55

TABLE 31

Oxygen

Conversion from milligrams per liter to milliliters per liter (NTP)
(1 mg/l = 0.6998 ml/l)

Milligrams per Liter of O_2	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.00	0.01	0.01	0.02	0.03	0.03	0.04	0.05	0.06	0.06
0.1	0.07	0.08	0.08	0.09	0.10	0.10	0.11	0.12	0.13	0.13
0.2	0.14	0.15	0.15	0.16	0.17	0.17	0.18	0.19	0.20	0.20
0.3	0.21	0.22	0.22	0.23	0.24	0.24	0.25	0.26	0.27	0.27
0.4	0.28	0.29	0.29	0.30	0.31	0.31	0.32	0.33	0.34	0.34
0.5	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.41	0.41
0.6	0.42	0.43	0.43	0.44	0.45	0.45	0.46	0.47	0.48	0.48
0.7	0.49	0.50	0.50	0.51	0.52	0.52	0.53	0.54	0.55	0.55
0.8	0.56	0.57	0.57	0.58	0.59	0.59	0.60	0.61	0.62	0.62
0.9	0.63	0.64	0.64	0.65	0.66	0.66	0.67	0.68	0.69	0.69

milligrams/liter	milliliters/liter	milligrams/liter	milliliters/liter
1.0	0.70	12.0	8.40
2.0	1.40	13.0	9.10
3.0	2.10	14.0	9.80
4.0	2.80	15.0	10.50
5.0	3.50	16.0	11.20
6.0	4.20	17.0	11.90
7.0	4.90	18.0	12.60
8.0	5.60	19.0	13.30
9.0	6.30	20.0	14.00
10.0	7.00	21.0	14.70
11.0	7.70	22.0	15.40

Example: Convert 5.65 milligrams/liter of O_2 to milliliters/liter.

5.00 milligrams/liter = 3.50
0.65 milligrams/liter = 0.45
3.95 milliliters/liter (ans.)

TABLE 32

Oxygen

Conversion from milligram-atoms per liter to milliliters per liter
(1 milligram-atom per liter of O_2 = 11.196 milliliters per liter of O_2)

Milligram-atoms/liter of O_2	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.00	0.00	0.01	0.02	0.03	0.04	0.06	0.07	0.08	0.09	0.10
0.01	0.11	0.12	0.13	0.15	0.16	0.17	0.18	0.19	0.20	0.21
0.02	0.22	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32
0.03	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.43	0.44
0.04	0.45	0.46	0.47	0.48	0.49	0.50	0.52	0.53	0.54	0.55
0.05	0.56	0.57	0.58	0.59	0.60	0.62	0.63	0.64	0.65	0.66
0.06	0.67	0.68	0.69	0.71	0.72	0.73	0.74	0.75	0.76	0.77
0.07	0.78	0.79	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88
0.08	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.99	1.00
0.09	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.09	1.10	1.11
0.10	1.12	1.13	1.14	1.15	1.16	1.18	1.19	1.20	1.21	1.22
0.11	1.23	1.24	1.25	1.27	1.28	1.29	1.30	1.31	1.32	1.33
0.12	1.34	1.35	1.37	1.38	1.39	1.40	1.41	1.42	1.43	1.44
0.13	1.46	1.47	1.48	1.49	1.50	1.51	1.52	1.53	1.55	1.56
0.14	1.57	1.58	1.59	1.60	1.61	1.62	1.63	1.65	1.66	1.67
0.15	1.68	1.69	1.70	1.71	1.72	1.74	1.75	1.76	1.77	1.78
0.16	1.79	1.80	1.81	1.82	1.84	1.85	1.86	1.87	1.88	1.89
0.17	1.90	1.91	1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00
0.18	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.09	2.10	2.12
0.19	2.13	2.14	2.15	2.16	2.17	2.18	2.19	2.21	2.22	2.23
0.20	2.24	2.25	2.26	2.27	2.28	2.30	2.31	2.32	2.33	2.34
0.21	2.35	2.36	2.37	2.38	2.40	2.41	2.42	2.43	2.44	2.45
0.22	2.46	2.47	2.49	2.50	2.51	2.52	2.53	2.54	2.55	2.56
0.23	2.58	2.59	2.60	2.61	2.62	2.63	2.64	2.65	2.66	2.68
0.24	2.69	2.70	2.71	2.72	2.73	2.74	2.75	2.77	2.78	2.79
0.25	2.80	2.81	2.82	2.83	2.84	2.85	2.87	2.88	2.89	2.90
0.26	2.91	2.92	2.93	2.94	2.96	2.97	2.98	2.99	3.00	3.01
0.27	3.02	3.03	3.05	3.06	3.07	3.08	3.09	3.10	3.11	3.12
0.28	3.13	3.15	3.16	3.17	3.18	3.19	3.20	3.21	3.22	3.24
0.29	3.25	3.26	3.27	3.28	3.29	3.30	3.31	3.33	3.34	3.35
0.30	3.36	3.37	3.38	3.39	3.40	3.41	3.43	3.44	3.45	3.46

TABLE 32 (Cont'd)

Oxygen

Conversion from milligram-atoms per liter to milliliters per liter
(1 milligram-atom per liter of O_2 = 11.196 milliliters per liter of O_2)

Milligram-atoms/liter of O_2	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.31	3.47	3.48	3.49	3.50	3.52	3.53	3.54	3.55	3.56	3.57
0.32	3.58	3.59	3.61	3.62	3.63	3.64	3.65	3.66	3.67	3.68
0.33	3.69	3.71	3.72	3.73	3.74	3.75	3.76	3.77	3.78	3.80
0.34	3.81	3.82	3.83	3.84	3.85	3.86	3.87	3.89	3.90	3.91
0.35	3.92	3.93	3.94	3.95	3.96	3.97	3.99	4.00	4.01	4.02
0.36	4.03	4.04	4.05	4.06	4.08	4.09	4.10	4.11	4.12	4.13
0.37	4.14	4.15	4.16	4.18	4.19	4.20	4.21	4.22	4.23	4.24
0.38	4.25	4.27	4.28	4.29	4.30	4.31	4.32	4.33	4.34	4.36
0.39	4.37	4.38	4.39	4.40	4.41	4.42	4.43	4.44	4.46	4.47
0.40	4.48	4.49	4.50	4.51	4.52	4.53	4.55	4.56	4.57	4.58
0.41	4.59	4.60	4.61	4.62	4.64	4.65	4.66	4.67	4.68	4.69
0.42	4.70	4.71	4.72	4.74	4.75	4.76	4.77	4.78	4.79	4.80
0.43	4.81	4.83	4.84	4.85	4.86	4.87	4.88	4.89	4.90	4.92
0.44	4.93	4.94	4.95	4.96	4.97	4.98	4.99	5.00	5.02	5.03
0.45	5.04	5.05	5.06	5.07	5.08	5.09	5.11	5.12	5.13	5.14
0.46	5.15	5.16	5.17	5.18	5.19	5.21	5.22	5.23	5.24	5.25
0.47	5.26	5.27	5.28	5.30	5.31	5.32	5.33	5.34	5.35	5.36
0.48	5.37	5.39	5.40	5.41	5.42	5.43	5.44	5.45	5.46	5.47
0.49	5.49	5.50	5.51	5.52	5.53	5.54	5.55	5.56	5.58	5.59
0.50	5.60	5.61	5.62	5.63	5.64	5.65	5.67	5.68	5.69	5.70
0.51	5.71	5.72	5.73	5.74	5.75	5.77	5.78	5.79	5.80	5.81
0.52	5.82	5.83	5.84	5.86	5.87	5.88	5.89	5.90	5.91	5.92
0.53	5.93	5.95	5.96	5.97	5.98	5.99	6.00	6.01	6.02	6.03
0.54	6.05	6.06	6.07	6.08	6.09	6.10	6.11	6.12	6.14	6.15
0.55	6.16	6.17	6.18	6.19	6.20	6.21	6.22	6.24	6.25	6.26
0.56	6.27	6.28	6.29	6.30	6.31	6.33	6.34	6.35	6.36	6.37
0.57	6.38	6.39	6.40	6.42	6.43	6.44	6.45	6.46	6.47	6.48
0.58	6.49	6.50	6.52	6.53	6.54	6.55	6.56	6.57	6.58	6.59
0.59	6.61	6.62	6.63	6.64	6.65	6.66	6.67	6.68	6.70	6.71
0.60	6.72	6.73	6.74	6.75	6.76	6.77	6.78	6.80	6.81	6.82

TABLE 32 (Cont'd)

Oxygen

Conversion from milligram-atoms per liter to milliliters per liter
(1 milligram-atom per liter of O_2 = 11.196 milliliters per liter of O_2)

Milligram-atoms/liter of O_2	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.61	6.83	6.84	6.85	6.86	6.87	6.89	6.90	6.91	6.92	6.93
0.62	6.94	6.95	6.96	6.98	6.99	7.00	7.01	7.02	7.03	7.04
0.63	7.05	7.06	7.08	7.09	7.10	7.11	7.12	7.13	7.14	7.15
0.64	7.17	7.18	7.19	7.20	7.21	7.22	7.23	7.24	7.26	7.27
0.65	7.28	7.29	7.30	7.31	7.32	7.33	7.34	7.36	7.37	7.38
0.66	7.39	7.40	7.41	7.42	7.43	7.45	7.46	7.47	7.48	7.49
0.67	7.50	7.51	7.52	7.53	7.55	7.56	7.57	7.58	7.59	7.60
0.68	7.61	7.62	7.64	7.65	7.66	7.67	7.68	7.69	7.70	7.71
0.69	7.73	7.74	7.75	7.76	7.77	7.78	7.79	7.80	7.81	7.83
0.70	7.84	7.85	7.86	7.87	7.88	7.89	7.90	7.92	7.93	7.94
0.71	7.95	7.96	7.97	7.98	7.99	8.01	8.02	8.03	8.04	8.05
0.72	8.06	8.07	8.08	8.09	8.11	8.12	8.13	8.14	8.15	8.16
0.73	8.17	8.18	8.20	8.21	8.22	8.23	8.24	8.25	8.26	8.27
0.74	8.29	8.30	8.31	8.32	8.33	8.34	8.35	8.36	8.37	8.39
0.75	8.40	8.41	8.42	8.43	8.44	8.45	8.46	8.48	8.49	8.50
0.76	8.51	8.52	8.53	8.54	8.55	8.56	8.58	8.59	8.60	8.61
0.77	8.62	8.63	8.64	8.65	8.67	8.68	8.69	8.70	8.71	8.72
0.78	8.73	8.74	8.76	8.77	8.78	8.79	8.80	8.81	8.82	8.83
0.79	8.84	8.86	8.87	8.88	8.89	8.90	8.91	8.92	8.93	8.95
0.80	8.96	8.97	8.98	8.99	9.00	9.01	9.02	9.04	9.05	9.06
0.81	9.07	9.08	9.09	9.10	9.11	9.12	9.14	9.15	9.16	9.17
0.82	9.18	9.19	9.20	9.21	9.23	9.24	9.25	9.26	9.27	9.28
0.83	9.29	9.30	9.32	9.33	9.34	9.35	9.36	9.37	9.38	9.39
0.84	9.40	9.42	9.43	9.44	9.45	9.46	9.47	9.48	9.49	9.51
0.85	9.52	9.53	9.54	9.55	9.56	9.57	9.58	9.59	9.61	9.62
0.86	9.63	9.64	9.65	9.66	9.67	9.68	9.70	9.71	9.72	9.73
0.87	9.74	9.75	9.76	9.77	9.79	9.80	9.81	9.82	9.83	9.84
0.88	9.85	9.86	9.87	9.89	9.90	9.91	9.92	9.93	9.94	9.95
0.89	9.96	9.98	9.99	10.00	10.01	10.02	10.03	10.04	10.05	10.07
0.90	10.08	10.09	10.10	10.11	10.12	10.13	10.14	10.15	10.17	10.18

TABLE 32 (Cont'd)

Oxygen

Conversion from milligram-atoms per liter to milliliters per liter
(1 milligram-atom per liter of O_2 = 11.196 milliliters per liter of O_2)

Milligram-atoms/liter of O_2	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.91	10.19	10.20	10.21	10.22	10.23	10.24	10.26	10.27	10.28	10.29
0.92	10.30	10.31	10.32	10.33	10.35	10.36	10.37	10.38	10.39	10.40
0.93	10.41	10.42	10.43	10.45	10.46	10.47	10.48	10.49	10.50	10.51
0.94	10.52	10.54	10.55	10.56	10.57	10.58	10.59	10.60	10.61	10.63
0.95	10.64	10.65	10.66	10.67	10.68	10.69	10.70	10.71	10.73	10.74
0.96	10.75	10.76	10.77	10.78	10.79	10.80	10.82	10.83	10.84	10.85
0.97	10.86	10.87	10.88	10.89	10.90	10.92	10.93	10.94	10.95	10.96
0.98	10.97	10.98	10.99	11.01	11.02	11.03	11.04	11.05	11.06	11.07
0.99	11.08	11.10	11.11	11.12	11.13	11.14	11.15	11.16	11.17	11.18
1.00	11.20	11.21	11.22	11.23	11.24	11.25	11.26	11.27	11.29	11.30
1.01	11.31	11.32	11.33	11.34	11.35	11.36	11.38	11.39	11.40	11.41
1.02	11.42	11.43	11.44	11.45	11.46	11.48	11.49	11.50	11.51	11.52
1.03	11.53	11.54	11.55	11.57	11.58	11.59	11.60	11.61	11.62	11.63
1.04	11.64	11.66	11.67	11.68	11.69	11.70	11.71	11.72	11.73	11.74
1.05	11.76	11.77	11.78	11.79	11.80	11.81	11.82	11.83	11.85	11.86
1.06	11.87	11.88	11.89	11.90	11.91	11.92	11.93	11.95	11.96	11.97
1.07	11.98	11.99	12.00	12.01	12.02	12.04	12.05	12.06	12.07	12.08
1.08	12.09	12.10	12.11	12.13	12.14	12.15	12.16	12.17	12.18	12.19
1.09	12.20	12.21	12.23	12.24	12.25	12.26	12.27	12.28	12.29	12.30
1.10	12.32	12.33	12.34	12.35	12.36	12.37	12.38	12.39	12.41	12.42
1.11	12.43	12.44	12.45	12.46	12.47	12.48	12.49	12.51	12.52	12.53
1.12	12.54	12.55	12.56	12.57	12.58	12.60	12.61	12.62	12.63	12.64
1.13	12.65	12.66	12.67	12.69	12.70	12.71	12.72	12.73	12.74	12.75
1.14	12.76	12.77	12.79	12.80	12.81	12.82	12.83	12.84	12.85	12.86
1.15	12.88	12.89	12.90	12.91	12.92	12.93	12.94	12.95	12.96	12.98
1.16	12.99	13.00	13.01	13.02	13.03	13.04	13.05	13.07	13.08	13.09
1.17	13.10	13.11	13.12	13.13	13.14	13.16	13.17	13.18	13.19	13.20
1.18	13.21	13.22	13.23	13.24	13.26	13.27	13.28	13.29	13.30	13.31
1.19	13.32	13.33	13.35	13.36	13.37	13.38	13.39	13.40	13.41	13.42
1.20	13.44	13.45	13.46	13.47	13.48	13.49	13.50	13.51	13.52	13.54

TABLE 32 (Cont'd)

Oxygen

Conversion from milligram-atoms per liter to milliliters per liter
(1 milligram-atom per liter of O_2 = 11.196 milliliters per liter of O_2)

Milligram-atoms/liter of O_2	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
1.21	13.55	13.56	13.57	13.58	13.59	13.60	13.61	13.63	13.64	13.65
1.22	13.66	13.67	13.68	13.69	13.70	13.72	13.73	13.74	13.75	13.76
1.23	13.77	13.78	13.79	13.80	13.82	13.83	13.84	13.85	13.86	13.87
1.24	13.88	13.89	13.91	13.92	13.93	13.94	13.95	13.96	13.97	13.98
1.25	14.00	14.01	14.02	14.03	14.04	14.05	14.06	14.07	14.08	14.10
1.26	14.11	14.12	14.13	14.14	14.15	14.16	14.17	14.19	14.20	14.21
1.27	14.22	14.23	14.24	14.25	14.26	14.27	14.29	14.30	14.31	14.32
1.28	14.33	14.34	14.35	14.36	14.38	14.39	14.40	14.41	14.42	14.43
1.29	14.44	14.45	14.47	14.48	14.49	14.50	14.51	14.52	14.53	14.54
1.30	14.55	14.57	14.58	14.59	14.60	14.61	14.62	14.63	14.64	14.66
1.31	14.67	14.68	14.69	14.70	14.71	14.72	14.73	14.75	14.76	14.77
1.32	14.78	14.79	14.80	14.81	14.82	14.83	14.85	14.86	14.87	14.88
1.33	14.89	14.90	14.91	14.92	14.94	14.95	14.96	14.97	14.98	14.99
1.34	15.00									

TABLE 33

Phosphorus

Conversion from micrograms per liter of inorganic P
to microgram-atoms per liter of P

(1 µg of P = 0.032285 µg-at of P)

Micrograms per Liter of inorganic P	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03

Micrograms per Liter of in-organic P	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
00	0.00	0.03	0.06	0.10	0.13	0.16	0.19	0.23	0.26	0.29
10	0.32	0.36	0.39	0.42	0.45	0.48	0.52	0.55	0.58	0.61
20	0.65	0.68	0.71	0.74	0.77	0.81	0.84	0.87	0.90	0.94
30	0.97	1.00	1.03	1.07	1.10	1.13	1.16	1.19	1.23	1.26
40	1.29	1.32	1.36	1.39	1.42	1.45	1.49	1.52	1.55	1.58
50	1.61	1.65	1.68	1.71	1.74	1.78	1.81	1.84	1.87	1.90
60	1.94	1.97	2.00	2.03	2.07	2.10	2.13	2.16	2.20	2.23
70	2.26	2.29	2.32	2.36	2.39	2.42	2.45	2.49	2.52	2.55
80	2.58	2.62	2.65	2.68	2.71	2.74	2.78	2.81	2.84	2.87
90	2.91	2.94	2.97	3.00	3.03	3.07	3.10	3.13	3.16	3.20
100	3.23	3.26	3.29	3.33	3.36	3.39	3.42	3.45	3.49	3.52
110	3.55	3.58	3.62	3.65	3.68	3.71	3.75	3.78	3.81	3.84
120	3.87	3.91	3.94	3.97	4.00	4.04	4.07	4.10	4.13	4.16

TABLE 34

Phosphate

Conversion from micrograms per liter of PO_4 to
microgram-atoms per liter of PO_4-P

(1 ug of PO_4 = 0.010529 ug-at of PO_4-P)

Micrograms per Liter of PO_4	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01

Micrograms per Liter of PO_4	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
00	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20
20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.31
30	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41
40	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52
50	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
60	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.71	0.72	0.73
70	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83
80	0.84	0.85	0.86	0.87	0.88	0.89	0.91	0.92	0.93	0.94
90	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02	1.03	1.04
100	1.05	1.06	1.07	1.08	1.10	1.11	1.12	1.13	1.14	1.15
110	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25
120	1.26	1.27	1.28	1.30	1.31	1.32	1.33	1.34	1.35	1.36
130	1.37	1.38	1.39	1.40	1.41	1.42	1.43	1.44	1.45	1.46
140	1.47	1.48	1.50	1.51	1.52	1.53	1.54	1.55	1.56	1.57
150	1.58	1.59	1.60	1.61	1.62	1.63	1.64	1.65	1.66	1.67
160	1.68	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.77	1.78
170	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.87	1.88
180	1.90	1.91	1.92	1.93	1.94	1.95	1.96	1.97	1.98	1.99
190	2.00	2.01	2.02	2.03	2.04	2.05	2.06	2.07	2.08	2.10
200	2.11	2.12	2.13	2.14	2.15	2.16	2.17	2.18	2.19	2.20
210	2.21	2.22	2.23	2.24	2.25	2.26	2.27	2.28	2.30	2.31
220	2.32	2.33	2.34	2.35	2.36	2.37	2.38	2.39	2.40	2.41
230	2.42	2.43	2.44	2.45	2.46	2.47	2.48	2.50	2.51	2.52
240	2.53	2.54	2.55	2.56	2.57	2.58	2.59	2.60	2.61	2.62
250	2.63	2.64	2.65	2.66	2.67	2.68	2.70	2.71	2.72	2.73

TABLE 34 (Cont'd)

Phosphate

Conversion from micrograms per liter of PO_4 to
microgram-atoms per liter of PO_4-P

Micrograms per Liter of PO_4	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
260	2.74	2.75	2.76	2.77	2.78	2.79	2.80	2.81	2.82	2.83
270	2.84	2.85	2.86	2.87	2.88	2.90	2.91	2.92	2.93	2.94
280	2.95	2.96	2.97	2.98	2.99	3.00	3.01	3.02	3.03	3.04
290	3.05	3.06	3.07	3.08	3.10	3.11	3.12	3.13	3.14	3.15
300	3.16	3.17	3.18	3.19	3.20	3.21	3.22	3.23	3.24	3.25
310	3.26	3.27	3.29	3.30	3.31	3.32	3.33	3.34	3.35	3.36
320	3.37	3.38	3.39	3.40	3.41	3.42	3.43	3.44	3.45	3.46
330	3.47	3.49	3.50	3.51	3.52	3.53	3.54	3.55	3.56	3.57
340	3.58	3.59	3.60	3.61	3.62	3.63	3.64	3.65	3.66	3.67
350	3.69	3.70	3.71	3.72	3.73	3.74	3.75	3.76	3.77	3.78

TABLE 35

Phosphorus Pentoxide

Conversion from micrograms per liter of P_2O_5 to microgram-atoms per liter of P
(1 µg of P_2O_5 = 0.014090 µg-atom of P)

Micrograms per Liter of P_2O_5	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01

Micrograms per Liter of P_2O_5	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
00	0.00	0.01	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.13
10	0.14	0.15	0.17	0.18	0.20	0.21	0.23	0.24	0.25	0.27
20	0.28	0.30	0.31	0.32	0.34	0.35	0.37	0.38	0.39	0.41
30	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55
40	0.56	0.58	0.59	0.61	0.62	0.63	0.65	0.66	0.68	0.69
50	0.70	0.72	0.73	0.75	0.76	0.77	0.79	0.80	0.82	0.83
60	0.85	0.86	0.87	0.89	0.90	0.92	0.93	0.94	0.96	0.97
70	0.99	1.00	1.01	1.03	1.04	1.06	1.07	1.08	1.10	1.11
80	1.13	1.14	1.16	1.17	1.18	1.20	1.21	1.23	1.24	1.25
90	1.27	1.28	1.30	1.31	1.32	1.34	1.35	1.37	1.38	1.39
100	1.41	1.42	1.44	1.45	1.47	1.48	1.49	1.51	1.52	1.54
110	1.55	1.56	1.58	1.59	1.61	1.62	1.63	1.65	1.66	1.68
120	1.69	1.70	1.72	1.73	1.75	1.76	1.78	1.79	1.80	1.82
130	1.83	1.85	1.86	1.87	1.89	1.90	1.92	1.93	1.94	1.96
140	1.97	1.99	2.00	2.01	2.03	2.04	2.06	2.07	2.09	2.10
150	2.11	2.13	2.14	2.16	2.17	2.18	2.20	2.21	2.23	2.24
160	2.25	2.27	2.28	2.30	2.31	2.32	2.34	2.35	2.37	2.38
170	2.40	2.41	2.42	2.44	2.45	2.47	2.48	2.49	2.51	2.52
180	2.54	2.55	2.56	2.58	2.59	2.61	2.62	2.63	2.65	2.66
190	2.68	2.69	2.71	2.72	2.73	2.75	2.76	2.78	2.79	2.80
200	2.82	2.83	2.85	2.86	2.87	2.89	2.90	2.92	2.93	2.94
210	2.96	2.97	2.99	3.00	3.02	3.03	3.04	3.06	3.07	3.09
220	3.10	3.11	3.13	3.14	3.16	3.17	3.18	3.20	3.21	3.23
230	3.24	3.25	3.27	3.28	3.30	3.31	3.33	3.34	3.35	3.37
240	3.38	3.40	3.41	3.42	3.44	3.45	3.47	3.48	3.49	3.51
250	3.52	3.54	3.55	3.56	3.58	3.59	3.61	3.62	3.64	3.65

Note: For values greater than 259, the conversion is to be obtained by addition.

TABLE 36

Nitrite

Conversion from micrograms per liter of NO_2 to microgram-atoms per liter of NO_2-N
(1 µg of NO_2 = 0.0217365 µg – at of NO_2-N)

Micrograms per Liter of NO_2	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
00	0.00	0.02	0.04	0.07	0.09	0.11	0.13	0.15	0.17	0.20
10	0.22	0.24	0.26	0.28	0.30	0.33	0.35	0.37	0.39	0.41
20	0.43	0.46	0.48	0.50	0.52	0.54	0.57	0.59	0.61	0.63
30	0.65	0.67	0.70	0.72	0.74	0.76	0.78	0.80	0.83	0.85
40	0.87	0.89	0.91	0.93	0.96	0.98	1.00	1.02	1.04	1.07
50	1.09	1.11	1.13	1.15	1.17	1.20	1.22	1.24	1.26	1.28
60	1.30	1.33	1.35	1.37	1.39	1.41	1.43	1.46	1.48	1.50
70	1.52	1.54	1.57	1.59	1.61	1.63	1.65	1.67	1.70	1.72
80	1.74	1.76	1.78	1.80	1.83	1.85	1.87	1.89	1.91	1.93
90	1.96	1.98	2.00	2.02	2.04	2.06	2.09	2.11	2.13	2.15
100	2.17	2.20	2.22	2.24	2.26	2.28	2.30	2.33	2.35	2.37
110	2.39	2.41	2.43	2.46	2.48	2.50	2.52	2.54	2.56	2.59
120	2.61	2.63	2.65	2.67	2.70	2.72	2.74	2.76	2.78	2.80
130	2.83	2.85	2.87	2.89	2.91	2.93	2.96	2.98	3.00	3.02
140	3.04	3.06	3.09	3.11	3.13	3.15	3.17	3.20	3.22	3.24
150	3.26	3.28	3.30	3.33	3.35	3.37	3.39	3.41	3.43	3.46
160	3.48	3.50	3.52	3.54	3.56	3.59	3.61	3.63	3.65	3.67
170	3.70	3.72	3.74	3.76	3.78	3.80	3.83	3.85	3.87	3.89
180	3.91	3.93	3.96	3.98	4.00	4.02	4.04	4.06	4.09	4.11
190	4.13	4.15	4.17	4.20	4.22	4.24	4.26	4.28	4.30	4.33
200	4.35	4.37	4.39	4.41	4.43	4.46	4.48	4.50	4.52	4.54

TABLE 37

Nitrate

Conversion from micrograms per liter of NO_3 to microgram-atoms per liter of NO_3-N

Micrograms per liter of NO_3	00	01	02	03	04	05	06	07	08	09
00	00.0	00.0	00.0	00.0	00.1	00.1	00.1	00.1	00.1	00.1
10	00.2	00.2	00.2	00.2	00.2	00.2	00.3	00.3	00.3	00.3
20	00.3	00.3	00.4	00.4	00.4	00.4	00.4	00.4	00.5	00.5
30	00.5	00.5	00.5	00.5	00.5	00.6	00.6	00.6	00.6	00.6
40	00.6	00.7	00.7	00.7	00.7	00.7	00.7	00.8	00.8	00.8
50	00.8	00.8	00.8	00.9	00.9	00.9	00.9	00.9	00.9	01.0
60	01.0	01.0	01.0	01.0	01.0	01.0	01.1	01.1	01.1	01.1
70	01.1	01.1	01.2	01.2	01.2	01.2	01.2	01.2	01.3	01.3
80	01.3	01.3	01.3	01.3	01.4	01.4	01.4	01.4	01.4	01.4
90	01.5	01.5	01.5	01.5	01.5	01.5	01.5	01.6	01.6	01.6

Micrograms per liter of NO_3	00	10	20	30	40	50	60	70	80	90
100	01.6	01.8	01.9	02.1	02.3	02.4	02.6	02.7	02.9	03.1
200	03.2	03.4	03.5	03.7	03.9	04.0	04.2	04.4	04.5	04.7
300	04.8	05.0	05.2	05.3	05.5	05.6	05.8	06.0	06.1	06.3
400	06.5	06.6	06.8	06.9	07.1	07.3	07.4	07.6	07.7	07.9
500	08.1	08.2	08.4	08.5	08.7	08.9	09.0	09.2	09.4	09.5
600	09.7	09.8	10.0	10.2	10.3	10.5	10.6	10.8	11.0	11.1
700	11.3	11.5	11.6	11.8	11.9	12.1	12.3	12.4	12.6	12.7
800	12.9	13.1	13.2	13.4	13.5	13.7	13.9	14.0	14.2	14.4
900	14.5	14.7	14.8	15.0	15.2	15.3	15.5	15.6	15.8	16.0
1000	16.1	16.3	16.5	16.6	16.8	16.9	17.1	17.3	17.4	17.6
1100	17.7	17.9	18.1	18.2	18.4	18.5	18.7	18.9	19.0	19.2
1200	19.4	19.5	19.7	19.8	20.0	20.2	20.3	20.5	20.6	20.8
1300	21.0	21.1	21.3	21.4	21.6	21.8	21.9	22.1	22.3	22.4
1400	22.6	22.7	22.9	23.1	23.2	23.4	23.5	23.7	23.9	24.0
1500	24.2	24.4	24.5	24.7	24.8	25.0	25.2	25.3	25.5	25.6
1600	25.8	26.0	26.1	26.3	26.4	26.6	26.8	26.9	27.1	27.3
1700	27.4	27.6	27.7	27.9	28.1	28.2	28.4	28.5	28.7	28.9
1800	29.0	29.2	29.4	29.5	29.7	29.8	30.0	30.2	30.3	30.5
1900	30.6	30.8	31.0	31.1	31.3	31.4	31.6	31.8	31.9	32.1
2000	32.3	32.4	32.6	32.7	32.9	33.1	33.2	33.4	33.5	33.7

TABLE 37 (Cont'd)

Nitrate

Conversion from micrograms per liter of NO_3 to microgram-atoms per liter of NO_3-N

Micrograms per liter of NO_3	00	10	20	30	40	50	60	70	80	90
2100	33.9	34.0	34.2	34.4	34.5	34.7	34.8	35.0	35.2	35.3
2200	35.5	35.6	35.8	36.0	36.1	36.3	36.4	36.6	36.8	36.9
2300	37.1	37.3	37.4	37.6	37.7	37.9	38.1	38.2	38.4	38.5
2400	38.7	38.9	39.0	39.2	39.4	39.5	39.7	39.8	40.0	40.2
2500	40.3	40.5	40.6	40.8	41.0	41.1	41.3	41.4	41.6	41.8
2600	41.9	42.1	42.3	42.4	42.6	42.7	42.9	43.1	43.2	43.4
2700	43.5	43.7	43.9	44.0	44.2	44.4	44.5	44.7	44.8	45.0
2800	45.2	45.3	45.5	45.6	45.8	46.0	46.1	46.3	46.4	46.6
2900	46.8	46.9	47.1	47.3	47.4	47.6	47.7	47.9	48.1	48.2
3000	48.4	48.5	48.7	48.9	49.0	49.2	49.4	49.5	49.7	49.8

NOTE: Conversion of values not given directly in the tables are derived by addition.

TABLE 38

Silicon

Conversion from micrograms per liter of Si to microgram-atoms per liter of Si
(1 μg of Si = 0.0356049 μg-atom Si)

Micrograms per Liter of Si	00	10	20	30	40	50	60	70	80	90
000	000	000	001	001	001	002	002	002	003	003
100	004	004	004	005	005	005	006	006	006	007
200	007	007	008	008	009	009	009	010	010	010
300	011	011	011	012	012	012	013	013	014	014
400	014	015	015	015	016	016	016	017	017	017
500	018	018	019	019	019	020	020	020	021	021
600	021	022	022	022	023	023	023	024	024	025
700	025	025	026	026	026	027	027	027	028	028
800	028	029	029	030	030	030	031	031	031	032
900	032	032	033	033	033	034	034	035	035	035

Micrograms per Liter of Si	000	100	200	300	400	500	600	700	800	900
1000	036	039	043	046	050	053	057	061	064	068
2000	071	075	078	082	085	089	093	096	100	103
3000	107	110	114	117	121	125	128	132	135	139
4000	142	146	150	153	157	160	164	1.67	171	174
5000	178	182	185	189	192	196	199	203	207	210
6000	214	217	221	224	228	231	235	239	242	246
7000	249	253	256	260	263	267	271	274	278	281
8000	285	288	292	296	299	303	306	310	313	317

EXAMPLE I:

Assume an initial value of 4200. Since this value lies within the range
1000 - 8900, use lower portion of above table. Enter left hand column
at 4000, proceed horizontally to the right to column headed 200, and read
150.

EXAMPLE II:

Assume an initial value of 4180. Since this value is not recorded explicitly
in the table, the conversion can be made by one of two methods:

TABLE 38 (Cont'd)

Silicon

(1) Interpolation between 4100 and 4200 to nearest whole number, <u>149</u>:

or (2) Since 4180 = 4100 + 80, find <u>146</u> corresponding to 4100 and <u>003</u>
corresponding to 80.
Add <u>146</u> and <u>003</u> to get 149.

TABLE 39

Silicon Dioxide

Conversion from micrograms per liter of SiO_2 to microgram-atoms per liter of SiO_2-Si
(1 µg of SiO_2 = 0.016643 µg-atom of Si)

Micrograms per Liter of SiO_2	00	10	20	30	40	50	60	70	80	90
000	000	000	000	000	001	001	001	001	001	001
100	002	002	002	002	002	002	003	003	003	003
200	003	003	004	004	004	004	004	004	005	005
300	005	005	005	005	006	006	006	006	006	006
400	007	007	007	007	007	007	008	008	008	008
500	008	008	009	009	009	009	009	009	010	010
600	010	010	010	010	011	011	011	011	011	011
700	012	012	012	012	012	012	013	013	013	013
800	013	013	014	014	014	014	014	014	015	015
900	015	015	015	015	016	016	016	016	016	016

Micrograms per Liter of SiO_2	000	100	200	300	400	500	600	700	800	900
1000	017	018	020	022	023	025	027	028	030	032
2000	033	035	037	038	040	042	043	045	047	048
3000	050	052	053	055	057	058	060	062	063	065
4000	067	068	070	072	073	075	077	078	080	082
5000	083	085	087	088	090	092	093	095	097	098
6000	100	102	103	105	107	108	110	112	113	115
7000	117	118	120	121	123	125	126	128	130	131
8000	133	135	136	138	140	141	143	145	146	148
9000	150	151	153	155	156	158	160	161	163	165
10000	166	168	170	171	173	175	176	178	180	181
11000	183	185	186	188	190	191	193	195	196	198
12000	200	201	203	205	206	208	210	211	213	215

TABLE 40

Silicate

Conversion from milligrams per liter of SiO_3 to microgram-atoms per liter of SiO_3-Si (1 milligram of SiO_3 = 13.1433 microgram-atoms of SiO_3-Si)

Milligrams per Liter of SiO_3	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
00	000	001	003	004	005	007	008	009	011	012
01	013	014	016	017	018	020	021	022	024	025
02	026	028	029	030	032	033	034	035	037	038
03	039	041	042	043	045	046	047	049	050	051
04	053	054	055	057	058	059	060	062	063	064
05	066	067	068	070	071	072	074	075	076	078
06	079	080	081	083	084	085	087	088	089	091
07	092	093	095	096	097	099	100	101	103	104
08	105	106	108	109	110	112	113	114	116	117
09	118	120	121	122	124	125	126	127	129	130
10	131	133	134	135	137	138	139	141	142	143
11	145	146	147	149	150	151	152	154	155	156
12	158	159	160	162	163	164	166	167	168	170
13	171	172	173	175	176	177	179	180	181	183
14	184	185	187	188	189	191	192	193	195	196
15	197	198	200	201	202	204	205	206	208	209
16	210	212	213	214	216	217	218	219	221	222
17	223	225	226	227	229	230	231	233	234	235
18	237	238	239	241	242	243	244	246	247	248
19	250	251	252	254	255	256	258	259	260	262
20	263	264	265	267	268	269	271	272	273	275

NATIONAL OCEANOGRAPHIC DATA CENTER
WASHINGTON 25, D. C.

**PHYSICAL AND CHEMICAL DATA FORM
FOR OCEANOGRAPHIC STATIONS**

NHO-NODC-3167/1 (9-61)

SURFACE ENVIRONMENTAL INFORMATION (MASTER CARD)

COUNTRY	SHIP	LATITUDE S = XS			LONGITUDE E = X10			MARSDEN SQUARE	DATE			TIME GMT		SHIP'S CRUISE NO.	SHIP'S STATION NO.	DEPTH TO BOTTOM (M)	MAX. SAMPLE

COL. 1 2 | 3 4 | 5 6 7 8 9 N S | 10 11 12 13 14 15 E W | 16 17 18 | YEAR 19 20 | MONTH 21 22 | DAY 23 24 | HR. 25 26 | 1/10 27 | 28 29 30 | 31 32 33 | 34 35 36 37 | 38 39

ADD. OBS. CODE	WATER		WAVE			WIND			BAR. (MBS)	AIR TEMPERATURE °C		WEATHER X W OR W W	CLOUD	VIS.	SPECIAL OBS.	PROCESSING NOS.	C T

COL. 40 41 | COLOR 42 43 | TRANS. 44 45 | DIR. 46 47 | H/A 48 | P 49 | DIR. 50 51 | SPEED/FORCE 52 53 | 54 55 56 | DRY B 57 58 59 | WET B 60 61 62 | 63 64 | T 65 | A 66 | 67 68 | 69 70 71 | 72 | REF. ID. NO. 73 74 75 | CONSEC. NO. 76 77 78 79 | 80

COUNTRY

INSTITUTE

VESSEL

CRUISE OR PROJECT NO.

SUBSURFACE OBSERVATIONS—(DETAIL CARDS)

MESSENGER TIME	DEPTH (M)	TEMP. °C	SAL. ‰	O₂	PO₄—P	TOTAL—P	NO₂—N	NO₃—N	Si O₃ - Si	pH	C C C T

OPTIONAL CHEMISTRY

COL. HR. 25 26 27 | 1/10 | 28 29 30 31 32 | 33 34 35 36 37 | 38 39 40 41 42 | 51 52 53 | 54 55 56 | 57 58 59 | 60 61 62 | 63 64 65 | 66 67 68 | 69 70 71 | 72 80

**OCEANOGRAPHIC STATION CARD
PHYSICAL AND CHEMICAL DATA**

REMARKS

SPECIFY OPTIONAL ITEMS OR SPECIAL CODES

GENERAL REMARKS

*IF MORE THAN 3 DIGITS, USE SPECIAL OBS. FIELD